

Economic Convergence Among Urban Areas In North Sumatera

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ABSTRACT

This research investigates the convergence of the urban regional economy in North Sumatera from 2018 to 2022, employing a quantitative and descriptive approach to analyze the factors influencing the Regional Gross Domestic Product (GRDP). Data, derived from the Central Statistics Agency (CSA), encompasses eight cities: Sibolga, Tanjungbalai, Pematangsiantar, Tebing Tinggi, Medan, Binjai, Padangsidempuan, and Gunung Sitoli. The study focuses on three independent variables—population (X1), Human Development Index (HDI) (X2), and Open Unemployment Rate (OUR) (X3)—aiming to understand their simultaneous and partial effects on GRDP. Hypotheses are formulated, indicating the anticipated influence of each variable, with the null hypothesis positing no significant effect. Utilizing eViews version 12 for panel data regression analysis, the results reveal that collectively, Population, HDI, and OUR significantly influence GRDP in the urban regions of North Sumatera. However, when analyzed individually, only HDI and TPT exhibit significant impacts, while Population does not. This suggests that the quality of human development and the unemployment rate play pivotal roles in driving economic convergence. The findings contribute to a nuanced understanding of the convergence dynamics in the cities studied, emphasizing the importance of targeted policies to foster inclusive and sustainable economic growth in the region.

Keyword: Convergence, Economic Growth, North Sumatera, Regional Economy, Urban Regions



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1. Introduction

Economic convergence is a phenomenon that has become a major concern in economic development in various countries. This term refers to the process or tendency where countries with low levels of income tend to catch up or approach countries with high income. This concept is central to the analysis of economic development, and further research on economic convergence has become important in detailing the factors driving global economic change. In the context of increasingly deepening economic globalization, economic convergence has become a key issue in efforts to reduce economic inequality between countries. This is also an essential question in understanding how the global economy interacts and how economic policy can influence the distribution of wealth and prosperity (Utami, 2022).

It is important to understand the concept of economic convergence in two main dimensions: absolute convergence and conditional convergence. Absolute convergence refers to the tendency of countries with low income to undergo faster economic renewal than countries with high income, thereby achieving higher income per capita. Meanwhile, conditional convergence emphasizes the importance of internal and external factors that drive the rate of economic renewal. In recent decades, technological developments and global capital flows have become the main drivers of economic convergence. Technological innovation, especially in the information and communications technology sector, has reduced barriers for developing countries to follow global economic trends. This allows them to improve productivity, diversify their economies, and achieve faster economic renewal (Putro, 2023).

However, economic convergence does not always run smoothly. There are various internal and external factors that can hinder countries in their efforts to approach higher per capita income. For example,

problems of corruption, political instability and social inequality can hinder sustainable economic renewal. In the Indonesian context, economic convergence is also an important issue. As a country with a large population and significant economic diversity between its regions, Indonesia strives to achieve inclusive and sustainable economic renewal. The government and stakeholders in Indonesia have attempted to create policies that support economic convergence between various regions in the country ([Pratama, 2021](#)).

Research on economic convergence is becoming increasingly important in formulating effective economic policies. In this research, we will discuss the factors that drive economic convergence, especially in the Indonesian context. We will also analyze the impact of globalization, technological developments, and other factors that contribute to the dynamics of economic convergence at the national and international levels. Through a more optimal understanding of economic convergence, it is hoped that we can develop more effective policies to overcome the problem of economic inequality, promote sustainable renewal, and create a fairer economic environment for all citizens. It is hoped that this research can provide valuable insights and sustainable solutions in facing future economic challenges ([Wahyunadi, 2019](#)).

Economic convergence, as discussed previously, is a central issue in economic development, and has its own urgency, especially when applied in the context of certain regions such as North Sumatra. This region, which has great economic potential and a diversity of natural resources, requires special attention in efforts to achieve inclusive and sustainable economic renewal. Per capita income and Gross Regional Domestic Product (GRDP) are the main indicators in measuring the welfare and economic development of a region. Economic convergence becomes a clear urgency when we look at the disparities in income and GRDP between regions in North Sumatra. Some regions may experience rapid economic renewal, while other regions are still lagging behind in terms of economic renewal and prosperity ([Muzani & Benardin, 2019](#)).

Economic convergence in North Sumatra is important because it has a direct impact on equitable development in this region. Through the convergence process, regions that are lagging behind can approach or catch up with regions that are more economically advanced. This helps reduce economic inequality and improve the standard of living of citizens throughout the North Sumatra region. It is important to note that the process of economic convergence is not only about increasing GRDP or per capita income of a region. This also involves increasing citizens' access to more optimal health, education, employment and infrastructure services. Encouraging equitable economic renewal, North Sumatra can create wider opportunities for its citizens, especially those living in rural or remote areas ([Pende & Ali, 2023](#)).

GRDP is a key indicator in measuring the impact of economic convergence in North Sumatra. The convergence process will be reflected in faster GRDP renewal in underdeveloped regions, thereby creating economic equality between these regions. Apart from that, increasing GRDP will also create investment opportunities and job creation, which will support sustainable economic development. However, economic convergence in North Sumatra also faces various challenges. Factors such as poor infrastructure, limited access to educational resources, and economic and political instability in some regions can become obstacles in achieving the goal of economic convergence ([Negara & Khoirunurrofik, 2021](#)).

In the context of North Sumatra, local governments, government institutions and other stakeholders have a very important role in encouraging economic convergence. Through policies that support infrastructure development, education, training and development of the local economic sector, North Sumatra can achieve economic renewal that is more evenly distributed in all its regions. Therefore, the urgency of economic convergence in North Sumatra is very important in order to achieve inclusive and sustainable economic development. Efforts to reduce economic inequality and improve the quality of life of citizens throughout the region must be a top priority, and the concept of economic convergence can be a strong guide in achieving these goals ([Rusta, 2022](#)).

GRDP (Gross Regional Domestic Product) for North Sumatra is a key indicator in measuring the economic health of this region. GRDP describes the total value of goods and services found in the area in one year. The use of GRDP helps in understanding the level of economic development, the contribution of economic sectors, and the potential for economic renewal in North Sumatra. North Sumatra's GRDP shows significant diversity in the economic sectors that make the largest contribution. Most of North Sumatra's GDP income comes from the agriculture, plantation, forestry and fisheries sectors. Along with its abundant natural potential, this region has long been a major producer of commodities such as palm oil, rubber, coffee and other agricultural findings. However, other sectors such as manufacturing, services and trade also play an important role in the North Sumatra economy. Medan City, the provincial capital, has become the center of economic and trade activity in this region. Improved infrastructure and connectivity, including international ports and airports, have supported the development of the trade and services sectors ([Elviera & Irawan, 2020](#)).

North Sumatra's GRDP, like many other regions in Indonesia, faces challenges in terms of economic inequality between urban and rural areas. Large cities such as Medan and its surroundings often have much

higher GRDP than rural areas which may still depend on traditional agriculture. This reflects unequal access to economic opportunities and social services. The urgency of economic convergence in North Sumatra is very relevant to the differences in GRDP between regions in this province. The economic convergence process aims to reduce this economic gap by increasing economic renewal in underdeveloped areas. This includes measures such as investment in infrastructure, education, workforce training, and support to local economic sectors ([Siregar, Lubis, & Inayah, 2023](#)).

Economic convergence in North Sumatra also plays an important role in improving the quality of life of citizens. By reducing economic inequality, the region can create a more stable and inclusive social environment. It also contributes to the creation of broader employment opportunities, reduces poverty, and improves the overall well-being of citizens. Apart from that, economic convergence in North Sumatra can encourage various economic sectors to grow in a more balanced manner. This will create sustainability in the development of the region and help reduce dependence on a single economic sector. Economic diversification will provide protection against fluctuations in commodity prices and changes in the global economy ([Manik, 2023](#)).

In conclusion, North Sumatra's GRDP is a reflection of the level of economic development and welfare of citizens in this region. Economic convergence is of deep urgency because it can help reduce economic inequality, improve the quality of life of citizens, and create sustainable economic renewal throughout the North Sumatra region. Efforts to achieve economic convergence must be the main focus in North Sumatra's economic development agenda ([Mulia & Putri, 2022](#)).

This research aims to fill the knowledge gap regarding economic convergence in North Sumatra, by exploring the factors that drive economic convergence in the region. There are quite a lot of previous studies on economic convergence in Indonesia in general, but there has been no research that specifically focuses on North Sumatra. Consequently, this research seeks to understand the concept of economic convergence at the regional level and identify the factors influencing economic renewal in the province. Relevant previous studies include research by Owusu-Manu, Jehuri, Edwards, Boateng, and Asumadu ([2019](#)) which highlights the importance of investment in infrastructure and connectivity as key factors in driving economic renewal in urban areas ([Owusu-Manu, Jehuri, Edwards, Boateng, & Asumadu, 2019](#)). Obradović, Vlačić, and Dabić ([2021](#)) which reviews the impact of globalization and technological developments on the manufacturing sector ([Obradović, Vlačić, & Dabić, 2021](#)). Pratama, Suparta, and Ratih ([2019](#)) who explain how the agricultural and plantation sectors play an important role in economic convergence ([Pratama, Suparta, & Ratih, 2022](#)). Ardhiyansyah, Sulistyowati, Hidayati, and Handayani ([2022](#)) which discusses social challenges and economic inequality in rural areas ([Ardhiyansyah, Sulistyowati, Hidayati, & Handayani, 2023](#)). Chaves-Avila and Gallego-Bano ([2020](#)) who examine the role of local government and public policy in facilitating economic convergence and its impact on regional development ([Chaves-Avila & Gallego-Bano, 2020](#)).

This research brings novelty by focusing on economic convergence in the urban area of North Sumatra by considering three main factors: population, Human Development Index (HDI), and Open Unemployment Rate. In the context of this research, novelty emerges from a comprehensive approach to understanding economic convergence by considering a number of important indicators that reflect the welfare of citizens, regional development, and the potential for economic renewal. Within this scope, this research will examine the interaction between population, HDI, and Open Unemployment Rate in the urban area of North Sumatra, and how these factors influence each other and contribute to economic convergence.

2. Research Methods

The following research adopts quantitative methods in analyzing variables that contribute to GRDP. The approach to this research is descriptive in discussing research findings with the existing economic convergence in North Sumatra. The data used comes from the Central Statistics Agency (BPS) and covers the period 2018 to 2022, meaning this is secondary data. The population of this research is the entire North Sumatra region, while the samples were selected from 8 cities in the region, namely Binjai, Gunung Sitoli, Medan, Padangsidempuan, Pematangsiantar, Sibolga, Tanjungbalai, and Tebing Tinggi.

The following research uses two categories of variables, namely the dependent variable (GRDP) and the independent variable, which includes population (X1), Human Development Index (HDI) (X2), and Open Unemployment Rate (TPT) (X3). Data analysis will be carried out using eViews version 12 software. Data is analyzed using panel data regression.

The research hypothesis consists of four statements. The research hypothesis is as follows:

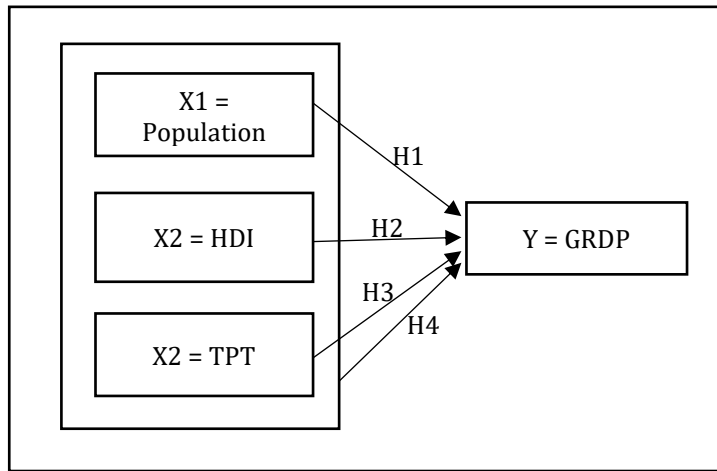
H1= Population contributes significantly to GRDP

H2= HDI contributes significantly to GRDP

H3= TPT contributes significantly to GRDP

H0= Population, HDI, and TPT do not contribute significantly to GRDP

This research will test these hypotheses by using relevant statistical analysis to identify the relationship and influence of these variables on GRDP. To explain the variables and hypotheses, you can see the following chart:



Figures1. Research hypothesis flow

3. Result And Discussion

Result

This research ultimately produced findings based on several stages of testing. The analysis carried out by panel data regression has several stages starting from model selection tests, classical assumption tests, and hypothesis tests. The author will explain the findings of this research carefully.

First, model selection test. Carrying out this model selection test also includes several testing stages. Starting from the chow test, Hausman test, Lagrange Multiplier (LM) test, to the selected mode selection test stage. Starting from the Chow test which determines between the Common Effect Model and the Fixed Effect Model, you can observe the following test findings:

Table1. Chow Test Findings

Effects Test	Statistics	df	Prob.
Cross-section F	336.679538 (7.29)		0.0000
Chi-square cross-section	176.399033	7	0.0000

The findings of the Chow test found a probability value of $0.0000 < \alpha 0.05$. Therefore, it is known that the superior model for the next stage of analysis is the Fixed Effect Model.

Then the Hausaman test was carried out in comparing the Fixed Effect Model and Random Effect Model. The findings can be observed from the table below:

Table2. Hausaman Test Findings

Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.
Random cross-section	9.605494	3	0.0222

The findings of the Hausaman test found that the probability value was 0.0222, which was smaller than $\alpha 0.05$. Therefore, it is known that the Fixed Effect Model is more optimal than the Random Effect Model.

Then the Lagrange Multiplier (LM) test is carried out to determine the best test findings between the Common Effect Model or Random Effect Model. The findings can be observed from the table below:

Table3. Lagrange Multiplier (LM) Test Findings

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	71.70407 (0.0000)	2.307041 (0.1288)	74.01111 (0.0000)
Honda	8.467826 (0.0000)	-1.518895 (0.9356)	4.913636 (0.0000)
King-Wu	8.467826 (0.0000)	-1.518895 (0.9356)	3.894632 (0.0000)
Standardized Honda	10.87026 (0.0000)	-1.328578 (0.9080)	3.512981 (0.0002)
Standardized King-Wu	10.87026 (0.0000)	-1.328578 (0.9080)	2.289577 (0.0110)
Gourieroux, et al.	--	--	71.70407 (0.0000)

The findings of the Hausman test found a Breush-Pagon (BP) probability value of $0.0000 < 0.005$. Therefore, the superior model to use based on these findings is Random Effect.

Based on the model selection test that the author has presented. Therefore, the Fixed Effect Model (FEM) model was chosen. The findings can be observed from the table below:

Table4. Model Selection Test Findings Found Fixed Effect Model (FEM)

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-34492126	10463694	-3.296362	0.0026
JK	-10.13654	7.086878	-1.430325	0.1633
HDI	985179.6	150207.8	6.558777	0.0000
TPT	-112746.4	34731.68	-3.246213	0.0029

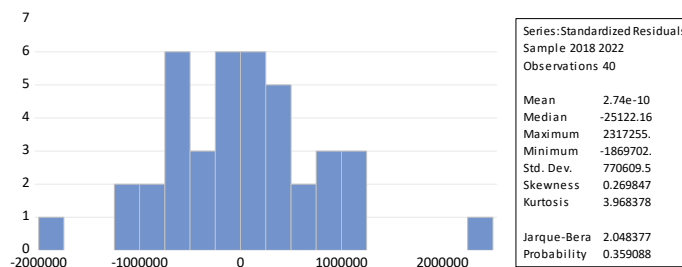
From the table above, it is known that the test findings of the selected model are completely Random Effect Model. To determine the regression equation, you can use the following formula:

$$LOG(PDRB)it = \beta_0it + \beta_1JKit + \beta_2IPMit + \beta_3TPTit + eit \tag{1}$$

The findings can be used to estimate panel data regression as follows:

$$LOG(HS) = -34.492.126 + -10,13654 (JK) + 985.179,6 (IPM) + -112.746,4 (TPT)$$

Based on the regression equation that has been explained, we are able to detail its interpretation. First, the constant value is -34,492,126 with a significance level of 0.0026 and has negative characteristics. As a result, it can be concluded that the correlation between variables X1, X2, and X3 and variable Y is negative. Second, the regression coefficient value X_1 is -10.13654, indicating that if variable Third, the regression coefficient X2 is 985,179.6, indicating that if variable X2 has an increase of one unit, variable Y will have an increase of 985,179.6. Fourth, the regression coefficient X3 of -112,746.4 indicates that if variable X3



Figures2. Normality Test Results Graph

experiences a decrease of one unit, variable Y will experience a decrease of -112,746.4. Thus, this interpretation provides a more detailed understanding of the contribution of each independent variable to the dependent variable in the context of regression analysis. Second, testing classical assumptions. This test is to fulfill multiple linear regression analysis based on Ordinary Least Square (OLS). The order of testing is normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test. Starting from the normality test which has the following findings:

The findings of this normality test found a probability value of $0.359088 > 0.05$. Therefore, it can be said that the data is normally distributed.

Based on the multicollinearity test in order to determine whether there are events in the model which can be seen from the findings of the correlation coefficient. The condition is that if the correlation coefficient has a value greater than 0.09, it is certain that there are symptoms of multicollinearity. The findings can be observed from the table below:

Table5. Multicollinearity Test Findings

	JK	HDI	TPT
JK	1,000	0.6377	0.2236
HDI	0.638	1,0000	0.3020
TPT	0.224	0.3020	1,0000

The findings of this multicollierity test found a probability value of <0.90 . From this value it can be assumed that there are no problems in the multicollierity problem in this research.

Based on the heteroscedasticity test to find similarities or dissimilarities in the regression model from the residuals of one observation to another. The findings can be observed from the table below:

Table6. Heteroscedasticity Test Findings

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-5638384.	7660615.	-0.736022	0.4676
JK	-3.982102	1.681098	-2.368751	0.0247
HDI	110982.4	105004.8	1.056927	0.2993
TPT	-33905.44	24192.79	-1.401469	0.1717

The findings of this multicollierity test found a probability value of $(\text{Obs} \cdot R) < 0.05$. From this value it can be assumed that there are no symptoms of heteroscedasticity in this research.

Based on the autocorrelation test to determine the correlation of variables in the time change prediction model. This test is observed from the Durbin - Waston values. The findings can be observed from the table shown below:

Table7, Findings of Autocorrelation Test with Durbin-Waston

R-squared	0.996647	Mean dependent var	33741839
Sum squared resid	2.51E+13	Durbin-Watson stat	2.515776

Based on the above values, the Watson Durbin value is 2.515776 with the Watson Durbin table values for dL and dU being 1.2484 and 1.7209, so the conclusion is that dU is $1.7209 < dw$ $2.515776 < dL$ 1.2484, therefore there is no autokeralization problem.

Third, hypothesis test Hypothesis tests in this research include the Coefficient of Determination Test, Simultaneous Test (F Test) and T Test. Referring to the findings of the Choe test, for data analysis in this research the Fixed Effect Model has been used which has been carried out by data transformation. The sequence of tests is starting from the coefficient of determination test, simultaneous test (F test), and partial test (T test). Regarding the coefficient of determination test, the test is to explain the amount of variation by the model. Here are the findings:

Table8. Coefficient of Determination Test Findings

MSE Root	707324.9	R-squared	0.997840
Mean dependent var	44894076	Adjusted R-squared	0.997095
SD dependent var	16334731	SE of regression	830711.0
Sum squared resid	2.00E+13	F-statistic	1339.712
Durbin-Watson stat	1.968425	Prob(F-statistic)	0.000000

Based on the processing findings, it shows that the adjusted R-squared figure is 0.997095. This shows that the percentage contribution of Population, HDI and Open Unemployment Rate contributes 2.42% to the GRDP of city areas in North Sumatra Province 2018-2022.

Then carry out a simultaneous test (F test) to find out how all the independent variables influence the dependent variable. The significance value has an important role in F testing. In this context, the significance value is a benchmark for determining the results of the F test. If the calculated F value is greater than the table F value, the null hypothesis (H0) is rejected. This means that the independent variables completely simultaneously have a significant influence on the dependent variable. Conversely, if the calculated F value is smaller than the table F value, then H0 is accepted. This indicates that completely together, the independent variable does not have a significant influence on the dependent variable. Thus, the significance value acts as a measure of success or failure in rejecting the null hypothesis in F testing. The findings are as follows:

Table9. Simultaneous Test Findings (F Test)

MSE Root	707324.9	R-squared	0.997840
Mean dependent var	44894076	Adjusted R-squared	0.997095
SD dependent var	16334731	SE of regression	830711.0
Sum squared resid	2.00E+13	F-statistic	1339.712
Durbin-Watson stat	1.968425	Prob(F-statistic)	0.000000

Referring to the table above, it is known that the f statistic value is 1339.712, with a probability level of $0.0000 < 0.05$, therefore it can be interpreted that H0 is rejected and Ha is accepted, meaning that completely simultaneous Population Number, HDI and Open Unemployment Rate contribute to the GRDP of city areas in North Sumatra Province 2018-2022.

Next, the next stage is to carry out a partial test, known as a t test, to evaluate the extent to which the independent variable influences the dependent variable. This t-test is executed to test the accuracy of the regression coefficients and determine whether the coefficient values are significant or not. In this process, the use of significance values is an important key. If the significance value of the t-test is low, then we can conclude that the regression coefficient has statistical significance, indicating that the independent variable is completely significant in moving the dependent variable. Conversely, if the significance value is high, the regression coefficient is considered not completely statistically significant. Thus, the t-test provides more detailed information about the contribution of each independent variable to the dependent variable in the context of regression analysis. The findings are as follows:

Table10. Partial Test Findings (T Test)

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-34492126	10463694	-3.296362	0.0026
JK	-10.13654	7.086878	-1.430325	0.1633
HDI	985179.6	150207.8	6.558777	0.0000
TPT	-112746.4	34731.68	-3.246213	0.0029

Based on the analysis of the table above, several findings regarding the influence of the independent variable on the dependent variable are completely partial. First, the findings show that the possible value of Population Number is 0.1633, which is greater than 0.05. These results imply that population does not have a significant influence on the Gross Regional Domestic Product (GRDP) of city areas in North Sumatra Province in the 2018-2022 period. Second, the possible value of HDI is 0.0000, which is less than 0.05. These findings indicate that the Human Development Index (HDI) had a significant influence on the GRDP of city areas in North Sumatra Province during that period. Third, the findings show a TPT probability value of 0.0029, which is also less than 0.05. As a result, it can be concluded that the Final Level of Education (TPT) contributes significantly to the GRDP of city areas in North Sumatra Province in the 2018-2022 period. These findings provide a deeper understanding of the relative contribution of each variable to the GRDP of city areas in the province, as well as identifying factors that have a significant impact or not in the context of this analysis.

Therefore, the findings of this research can be deduced that the independent variables consisting of HDI and TPT have been accepted as significantly positive by GRDP. This is because both values are smaller than alpha or < 0.05 . Meanwhile, the independent variable of population is not accepted, aka it is significantly negative by GRDP. Because the value of the population is greater than the alpha value or > 0.05 . These are the final findings from the convergence of eight cities in North Sumatra from 2018-2022.

Discussion

Based on the research findings presented, it seems that there are interesting findings related to the relationship between the variables Population Number, Human Development Index (HDI), Open Unemployment Rate (TPT), and Gross Regional Domestic Product (GRDP) of city areas in North Sumatra Province in the 2018 period. -2022.

In a simultaneous test (F test), a regression model involving these three variables fully together shows a significant influence on GRDP. The high Adjusted R-squared value, reaching 99.71%, indicates that the model is able to explain most of the variation in GRDP in city areas. This illustrates the convergence of models in summarizing the contribution of Population, HDI, and TPT to economic renewal.

However, in the partial test (T Test), there were interesting findings regarding the influence of each variable completely individually. Population size is not proven to have a significant influence on GRDP, while HDI and TPT show a real influence. This provides a more detailed picture of the role of each factor in the dynamics of economic renewal in urban areas.

The important role of HDI as a factor that contributes significantly to GRDP is highlighted in this discussion. A very low probability value, namely 0.0000, this finding illustrates that aspects including health, education and living standards have a significant impact on economic renewal. As a result, strengthening policies that support increasing HDI is considered crucial in stimulating sustainable economic renewal.

Meanwhile, the role of TPT which has been proven to contribute significantly opens up opportunities for the development of more appropriate policies in dealing with the issue of unemployment. The possible value is 0.0029, this finding shows that efforts to reduce the unemployment rate can make a positive contribution to the economic renewal of the city area. Implementing training, education and job creation programs can be strategic steps in overcoming this problem.

Although Population Population has not been shown to have a completely partial effect, understanding its full overall impact is still important. A deeper analysis may be needed to understand how this factor interacts with other variables and how changes in population can affect GRDP at the regional level.

The findings of this research are relevant to other research. As in research by Manalu, Nurlina, and Miswar (2023) which investigated the impact of HDI (Human Development Index), GRDP, and the number of poverty workers. This research was carried out with the aim of evaluating the effect of the Human Development Index (HDI), Gross Regional Domestic Product (GRDP), and Number of Workers on poverty levels in North Sumatra Province in the period 2008-2023. The analytical approach used is multiple linear regression using the E-Views version 12 application. The research results show that completely separately, the Human Development Index (HDI) variable has a negative and significant impact on the poverty level in North Sumatra Province. On the other hand, the Gross Regional Domestic Product (GRDP) variable has a negative but not significant impact on the poverty level in the region. Meanwhile, the number of workers variable has a positive but not significant impact on the poverty level. Furthermore, completely simultaneously, it is proven that the Human Development Index (HDI), Gross Regional Domestic Product (GRDP), and Number of Workers together have a significant impact on the level of poverty in North Sumatra Province. With these findings, it can be concluded that these factors have an important role in explaining the level of poverty in the region during the period studied. ([Manalu, Nurlina, & Miswar, 2023](#)).

Other relevant research from Manik, Pardede, and Tampubolon (2023). This research was executed with the aim of identifying the impact of Gross Regional Domestic Product (GRDP) and Human Development Index (HDI) on poverty levels in North Sumatra during the 2013-2022 period. The data used is quantitative and obtained from secondary sources, namely the official website of the North Sumatra Regional Statistics Center. The analytical method applied is multiple linear regression using E-Views 10 software. The research results show that GRDP has a negative influence, although not significant, on the poverty level in North Sumatra during that period. Meanwhile, the Human Development Index (HDI) shows a positive, but not significant, influence on poverty levels in the region during the same period. Interpretation of these findings indicates that GRDP and HDI may have an impact on poverty, although not completely significant. In this context, further evaluation needs to be carried out to understand other factors that may play a role in the dynamics of poverty in North Sumatra. ([Manik, Pardede, & Tampubolon, 2023](#)).

Purba, Harahap, and Sinaga (2023) also provide similar research. This research focuses on analyzing the impact of economic reform and unemployment rates on poverty levels in North Sumatra Province. Secondary time series data from 2005-2020, obtained from the North Sumatra Central Statistics Agency (BPS), was used to enable in-depth insight. The research findings yield interesting results: first, economic reform (GDP) has a negative and significant influence on the number of poor people in the province. Second, unemployment has a positive and significant impact on the number of poor people in North Sumatra. Third,

completely simultaneously, economic renewal and unemployment have a significant influence on the number of poor people in the region. Fourth, the contribution of economic renewal (GDP) and unemployment to the poverty level in North Sumatra reached 82.81%. These findings not only illustrate the complex interactions between economic renewal and unemployment rates, but also provide an important contribution to understanding poverty dynamics in the province. By highlighting the relationship between these factors, this research can provide a valuable basis for efforts to reduce poverty in North Sumatra. ([Purba, Harahap, & Sinaga, 2023](#)).

Apart from the empirical findings, at this stage of the discussion, I would like to add some opinions. First, this research makes an important contribution in the context of regional development policy formulation. These findings can be a basis for local governments in developing more targeted and effective policies to achieve more equitable economic renewal.

Second, it should be noted that the findings of this research are contextual and can be influenced by various additional factors not included in the model. As a result, further research involving other variables or spatial analysis could be the next step to obtain a more comprehensive understanding.

In the context of this research, convergence theory can provide an additional perspective to the findings previously described. Convergence theory suggests that regions or countries that initially have a low economic level tend to experience economic renewal more quickly than regions or countries that already have a high economic level, thereby ultimately achieving a greater level of equality. ([Udhar, 2020](#)).

In relation to research regarding the contribution of population, HDI and open unemployment rate to the Gross Regional Domestic Product (GRDP) of city areas in North Sumatra Province, convergence theory can provide a broader context. Although research findings show a significant influence of HDI and Open Unemployment Rate on GRDP, convergence theory can explain how regions that initially have a low economic level can "approach" or "converge" to regions with a higher economic level ([Haidir, 2022](#)).

In the framework of convergence theory, the assumption that regions with a low initial economic level will grow faster indicates that development policies that encourage an increase in HDI and a reduction in the Open Unemployment Rate can be strategic steps. Regions that implement these policies effectively can experience faster economic renewal and, ultimately, achieve higher levels of economic equality ([Hartanti & Taufiq, 2023](#)).

As for the finding that population does not contribute significantly to GRDP, convergence theory can provide context regarding how a large population in an area is not always a detrimental factor for economic renewal. On the other hand, convergence theory can ask the question whether the role of population will be more significant in the long run or whether there are certain factors that moderate this relationship. ([Ramadhana, 2023](#)).

This research makes an important contribution in the context of convergence theory by showing that factors such as HDI and Open Unemployment Rate can be a driver of significant economic renewal in areas that may initially have low economic levels. By focusing on these variables, development policies can be focused on improving the welfare of citizens and creating conditions that support sustainable economic renewal. ([Zahara, Adha, Adiwinata, & Nurhikmat, 2021](#)).

However, it is important to remember that convergence theory is general and can be influenced by various factors, including economic policy, political stability, and other factors. Consequently, interpretation of these research findings in the context of convergence theory needs to take into account regional or country-specific contexts and dynamics ([Hartati, 2019](#)).

Furthermore, to complete this discussion, it is necessary to pay attention to convergence indicators that can increase understanding of the findings of this research. Convergence indicators are often used to measure the extent to which a region or country has achieved a level of economic equality with other regions or countries. In the context of research on urban economic renewal in North Sumatra Province, several convergence indicators could be a useful addition. ([Wijayanto, 2023](#)).

One relevant indicator is Convergent Renewal. This indicator can provide an idea of whether regions with a low initial economic level experience faster economic renewal compared to regions that already have a high economic level. By analyzing economic renewal trends over time, it can be identified whether there is convergence or divergence between regions ([Tubagus, 2023](#)).

Convergent Renewal can be measured by calculating the average level of economic renewal for each regional group based on the initial economic level. If regions with a low initial economic level experience faster renewal than regions with a high economic level, this can be considered a sign of economic convergence. ([Supriyanti, 2020](#)).

Apart from Convergent Updates, you can also pay attention to the Revenue Disparity indicator. This indicator measures the extent to which the level of breeding between regions is close to equality. Reducing

income disparities between regions is an indication that economic convergence is taking place ([Zahra & Muttaqin, 2023](#)).

Reducing income disparities can be interpreted as a redistribution of wealth and economic opportunities between regions. As a result, analysis of how differences in Population, HDI, and Open Unemployment Rate contribute to reducing income disparities can provide a deeper understanding of the dynamics of economic convergence in North Sumatra Province ([Sari & Saputra, 2022](#)).

In evaluating economic convergence, it is important to also take into account the Convergent Resilience indicator. This indicator reflects the extent to which a region can maintain an even level of economic renewal over a long period of time. Considering factors such as economic stability, investment in human capital, and resilience to global economic change, we can evaluate whether the economic reforms that are taking place are sustainable. ([Samir, 2021](#)).

Paying attention to these convergence indicators, this research can complete the understanding of the dynamics of economic renewal in North Sumatra Province. In-depth analysis of convergence indicators can provide richer insight into the extent to which regional development policies have converged in promoting economic equality ([Irwan & Firmansyah, 2023](#)).

They can be a very useful tool in designing more effective development policies. Understanding more optimally the dynamics of economic convergence, regional governments can identify areas that require special attention and design more targeted policies to achieve equitable economic renewal throughout the region. ([Ihsani & Rohman, 2022](#)).

Overall, the use of convergence indicators could be a significant step to complement the findings of this research. Involving these indicators, research can provide a more holistic contribution to understanding the concept of economic convergence and help formulate more targeted policy recommendations. ([Ginanjari, Suci, Zahara, Anwar, & Suhendra, 2021](#)).

In addition to Convergent Renewal, Convergence Disparity, and Convergent Resistance, it is also important to consider the Convergence Index or Absolute Convergence. This index measures the extent of absolute differences in economic levels between regions over time. In other words, the Convergence Index shows whether regions with a lower economic level have a tendency to approach a higher economic level ([Rafiqi, 2022](#)).

The use of the Convergence Index can provide a more specific picture of the dynamics of economic convergence in North Sumatra Province. If the Convergence Index value is positive, this can mean that there is a significant convergence effort, and regions with a lower economic level are completely consistent with regions with a higher economic level. ([Novika, 2021](#)).

Additionally, analysis involving the Convergence Dependency Index is also relevant. This index measures how much economic renewal in an area is influenced by economic renewal in the surrounding area. If the Convergence Dependency Index value is high, this could indicate the existence of interdependence between regions in the process of economic convergence ([Faramita, 2023](#)).

Taking into account the Convergence Dependency Index, we can identify whether there are certain regions that are "leaders" of economic renewal, which in turn can provide insight into collaborative strategies that can be implemented at the regional level to accelerate economic convergence. In evaluating economic convergence, it is also necessary to involve the spatial dimension. Geographical mapping of economic renewal and the distribution of key variables such as HDI, Population, and Open Unemployment Rate can provide a richer view of convergence patterns at the regional level. In the context of this research, it needs to be emphasized that the concept of economic convergence is not only numerical, but also involves social and spatial dynamics. The involvement of local citizens, the role of the private sector, and the impact of local government policies can also influence economic convergence in a region ([Hamartoni, 2023](#)).

The addition of these convergence indicators means that a holistic and multidimensional approach can provide a more comprehensive picture of the economic convergence process in North Sumatra Province. Involving various indicators, this research can provide a deeper understanding of the complex interactions between these variables and their contribution to economic equality ([Hidayat, Tato, & Syafri, 2021](#)).

The importance of economic convergence in the context of North Sumatra Province becomes increasingly apparent when we consider the aspects of citizen welfare in a comprehensive manner. Convergence not only creates equitable economic renewal between regions, but also has the potential to reduce socio-economic disparities. Focusing on key factors such as the Human Development Index (HDI), Open Unemployment Rate (TPT), and Population, this research has a direct impact on the quality of life of citizens ([Bahar et al., 2022](#)).

Economic convergence has a positive impact on economic inclusiveness, leading to a fairer distribution of benefits across regions. To create equitable economic renewal, regions with low initial

economic levels have greater opportunities to develop infrastructure, education and health services. This can create a more empowered environment and improve the quality of life for local residents. Apart from that, economic convergence also has important implications in the context of regional development policy. The findings of this research can provide valuable guidance for local governments in designing policies oriented towards economic convergence. A deeper understanding of the key variables that contribute to economic renewal can help formulate more effective and efficient policy strategies, ([Anwar, 2022](#)).

From a macro perspective, economic convergence at the regional level can strengthen overall national economic stability. With regions growing rapidly and approaching the national economic level, the potential contribution to national economic renewal will be even greater. This can create a more resilient and sustainable economic environment. From an investment perspective, economic convergence can also be an attraction for investors. Regions that show high potential for economic convergence can become profitable investment destinations. This investment can create job opportunities, increase productivity, and overall make a positive contribution to regional economic development([Hamartoni, 2023](#)).

In designing effective development policies, it is also necessary to understand that economic convergence is not an end goal, but a process that requires continuous monitoring and evaluation. Involving the concept of convergence, local governments can design policies that are adaptive and responsive to changing economic dynamics. The urgency of convergence in this research is that this concept is not only a goal to be pursued, but also a basis for sustainable and inclusive economic development. By identifying key variables and analyzing convergence dynamics, this research provides a deeper view of how development policies can be focused on achieving more equitable economic renewal in North Sumatra Province.

This research makes an important contribution in directing the implementation of poverty reduction policies in North Sumatra Province. The finding that economic reform (GDP) has a negative and significant impact on the number of poor people shows the need for a more inclusive economic development strategy. Policy implementation can be focused on developing sectors that have the potential to have a direct impact on improving the welfare of citizens.

In addition, the finding that the unemployment rate has a positive and significant impact on the number of poor people highlights the urgency of employment policies oriented towards job creation. Skills training and economic empowerment programs can be an important instrument in overcoming the challenges of unemployment and reducing poverty levels.

Overall, policy implementation can be focused on synergistic efforts between government, the private sector and citizens to create an inclusive and sustainable economic environment. Encouraging investment in sectors with high potential for innovation, such as creative industries or the service sector, could be a strategic step. Economic empowerment through entrepreneurship programs and support for micro, small and medium enterprises (MSMEs) can also be a solution to increase citizen literacy.

Furthermore, local governments can collaborate with educational and training institutions to create programs that support improving workforce skills in accordance with market needs. Thus, this can increase the competitiveness of the workforce and reduce the unemployment rate.

In implementing policies, it is important to actively involve stakeholders, such as citizen organizations, companies and educational institutions. It is hoped that these steps can create a sustainable synergistic effect in overcoming the challenges of poverty in North Sumatra Province.

Apart from direct efforts in the economic sector, policy implementation can involve other aspects that support poverty reduction in North Sumatra Province. Strengthening the education sector and skills training can be a priority to improve workforce qualifications and create more optimal access to decent work. Scholarship programs or educational assistance can also be expanded to increase citizen participation in education.

Improving social infrastructure, such as access to health services and sanitation, can be an important part of overcoming poverty. The availability of affordable and quality health facilities can help improve the welfare of citizens and reduce the burden of health costs. Meanwhile, increasing accessibility to transportation and other basic infrastructure can open up economic opportunities in previously isolated areas.

Furthermore, it is important to collaborate with the private sector and support local economic initiatives. Collaboration between the government and the private sector can create sustainable investment and have a positive impact on economic renewal and job creation. CSR (Corporate Social Responsibility) initiatives from companies can be directed to support citizen development programs. In this context, policy implementation also needs to consider aspects of environmental sustainability. Sustainable and environmentally friendly economic development can help maintain ecosystem balance and increase the environmental resilience of citizens.

Fully actively involving citizens in policy planning and implementation is the key to success. Participatory processes can provide direct insight from citizens about their needs and help build a sense of ownership for development programs. With this approach, policy implementation can be more responsive and in line with the realities faced by the citizens of North Sumatra. Through these steps, it is hoped that policy implementation can create a sustainable positive impact in reducing poverty levels in North Sumatra Province.

4. Conclusion

In conclusion, this research provides valuable insight into the dynamics of economic renewal in urban areas in North Sumatra Province during the 2018-2022 period. Research findings highlight the significant role of the Human Development Index (HDI) and Open Unemployment Rate (TPT) in supporting more equitable economic renewal in the region. However, the population in the region is actually an insignificant influencing factor for economic reform. Although Population Numbers are not proven to contribute completely partially, these findings suggest that a focus on aspects of welfare and employment could be key in stimulating inclusive economic renewal. With a high Adjusted R-squared value, this research confirms that the regression model involving HDI and TPT together fully explains variations in GRDP in city areas. The use of convergence theory provides a relevant context in understanding that regions with low initial economic levels can approach regions with higher economic levels. Analysis of economic convergence in North Sumatra Province involves key factors such as HDI, Population, and TPT, opening the door to more focused and effective policy formulation. It is important to note the urgency of the concept of convergence in the context of regional development. Convergence is not only an end goal, but also a process that can bring significant socio-economic benefits. By creating equitable economic renewal, economic convergence can reduce social disparities, create job opportunities, and have a positive impact on the quality of life of citizens. The selection of convergence indicators, such as Convergence Renewal, Convergence Disparity, Convergence Index, and Convergence Dependency Index, provides additional nuance to the analysis, enriching the understanding of the dynamics of economic convergence in the region. Spatial analysis and time dimensions provide a more holistic perspective for the convergence process. This research makes a significant contribution to understanding the concept of economic convergence and provides a strong foundation for the formulation of more effective development policies in North Sumatra Province. Involving various variables and indicators of convergence, this research provides a comprehensive view of the factors influencing regional economic renewal.

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