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Spatial Autocolleration and Economic Convergence in Lampung Province

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Abstract

The regional economy is in space and time, space is an important strength in the activity of an economy. This study examines spatial dependencies in observing economic activity in the form of regions and the convergence hypothesis as a study to see the economic gap between poor and rich regions. The spatial interaction of the economy in this study uses the Moran I statistical method, LISA Signification, and LISA Clustered map, the Convergence Study is analyzed using ordinary least square panel data using the Fixed Effect model approach. This study uses secondary data and panel data with 15 districts and cities and the 2015-2019 time series. Testing Results spatial relationship between the GDP per capita 15 districts and cities in the province of Lampung year 2015-2019, there has been a positive spatial autocorrelation spatial pattern formation has a regional grouping of Economy with the indication of the same characteristics. A process of absolute convergence is marked and significant negative coefficient, an indication of speed- reducing the economic gap of 4.8%, so that the time required in a process of reducing the gap from the initial gap was 14.17 years in 15 districts and cities in the province of Lampung Year 2015-2019.

Key words : Regional Economy, Spatial Interaction, Absolute Convergence.

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INTRODUCTION

Regional economic development is still the key to the success of each country and each part of a country to continue to turn the wheels of the economy. Regional development in each region that is far from the center of growth also aims to overcome economic inequality and problems of social, economic, and environmental inequality. Many economic studies have tried to analyze growth. Since Solow's contribution in 1956, the examination of growth dynamics has been at the forefront of theoretical and empirical investigation. In line with that, several studies have explored the causes and characteristics of regional, growth processes within a country (Annoni et al., 2019).

The problem that often arises in the process of economic development is inequality between regions, a province will progress more rapidly than its neighboring regions. This is one of the main development issues in developing countries. Regional inequality occurs because of uneven development, this inequality is the effect of agglomeration where cities have a fast growth acceleration while rural areas tend to have low growth.

The concept of convergence shows the hypothesis that each region has a unique intrinsic potential so that in a fairly long time there will be a condition in which each region will grow by itself. Areas that are initially less developed will grow faster than other areas with better initial conditions. In the end, the less developed regions will be able to catch up (catch-up) more advanced regions in such a way as to achieve growth and at the same time equal distribution between regions (Mankiw, 2003; R. J. Barro & Sala-I-Martin, 1992).

According to R. J. Barro & Sala-I-Martin (1997), explaining the absolute convergence approach the extent to which the main variables of economic growth affect future growth rates, absolute convergence explains diminishing returns to capital. In neoclassical thinking that economic growth in developed countries will tend to grow more slowly than the economy of poor countries due to diminishing returns to capital.

The phenomenon of convergence is still an interesting topic in Indonesia, which has a coverage area that is divided into provinces and there are various districts in it. Fahmi (2017), the phenomenon of convergence in Indonesia is motivated by persistent regional disparities, in the long term the Indonesian economy will tend to converge at a rate of 8.08% per year. Findings with different speeds were reviewed by (Tajerin et al., 2017), that there has been a tendency for the process of economic convergence of the main island regions (Sumatra, Java, Kalimantan, Sulawesi, and Papua) in Indonesia, the speed of economic convergence is 3.22-8, 50%. The slow convergence process due to the low level of investment in both physical and human capital in the poor or less developed coastal-based main island areas is the cause.

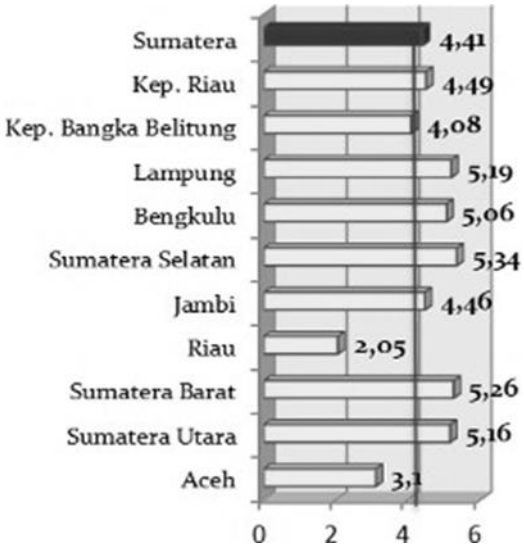
Each Region has different regional specifications and different levels of GRDP and economic growth, this is a discussion that the ability of the region determines a strength in the convergence process. Achmad (2017), sigma convergence analysis shows that there is no convergence in economic growth in Central Sulawesi Province 2010-2014. The results of the analysis with Beta convergence show the existence of absolute convergence in the economic growth of districts/ cities in Central Sulawesi. Amalia et al. (2018), East Java's economic growth is converging at a low level. this convergence is not influenced by policy factors. Furthermore, this low absolute convergence rate needs to be accelerated through policy factors issued by the government so that reducing inequality can also be accelerated.

In addition to the view that spatial effects are becoming an integral part of empirical theory and practice, the growing attention to spatial perspectives is driven by a shift in theoretical focus, providing new theoretical perspectives for analyzing phenomena, such as neighboring effects, environmental effects, spatial spillovers and network effects (Anselin, 2007). The integration of the spatial dimensions of externalities allows for a better appreciation of the theory of spatial growth. The effect of externalities on economic convergence in terms of economic integration in space, makes it possible to measure the multiple effects of geographic spillovers and to validate the hypothesis that accounting for spatial externalities does not necessarily reduce divergence (Naceur, 2009)

Hirschman (1984), development is polarized so that it can benefit both the growing region and its surroundings. Hirschman argues that growth in developing regions will result in a gain called the "trickle down effect". In the end, Hirschman believes that the trickle-down effect will be greater than the polarization effect due to increased pressure to implement economic policies.

The topic of convergence is a relevant issue to be studied because one of the goals of national development is to achieve equitable development. In the leadership of President Joko Widodo issued nine programs (Nawa Cita) and one of them is developing Indonesia from the periphery by strengthening regions and villages within the framework of a unitary state. The massive infrastructure development that has been carried out will prioritize programs on regional economic empowerment and the village economy, with appropriate innovation and technology and continue infrastructure development.

Sumatra Island is one of the largest islands in Indonesia with an area of about 443,065.8 km² and is the island with the second-fastest economic development after Java. The rapid economic activity on this island is supported by the potential of its abundant natural resources and its very strategic location has excellent access so that it becomes Indonesia's main gateway in the west. In the national development agenda for 2014-2019, the island of Sumatra is focused on the development of centers of economic growth, as the main engine of growth, in each island outside Java, especially in the economic corridor area, by exploring the potential and advantages area.



Source: Indonesian Central Bureau of Statistics, data processed.

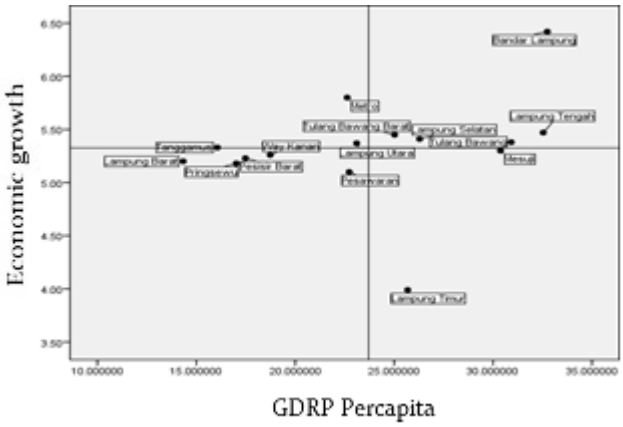
Figure 1. Average Economic Growth of Provinces in Sumatra Island in 2015-2019

Based on the data in figure 1. it can be seen that the average economic growth rate of South Sumatra Province is the highest in Sumatra at 5.34%, followed by West Sumatra Province with an average economic growth rate of 5.26% and Lampung Province with an average growth rate of 5.34%. The economy is 5.19, while the lowest average economic growth rate is Aceh Province at 3.10%. In the Economic growth rate data from 2015-2019, Lampung Province has a stable growth rate of 5% and always has a higher number than the island of Sumatra and has the 3rd highest average growth rate on the island of Sumatra.

The condition of the 3rd lowest GRDP is Rp. 26,688.30 million Rupiah but the average economic growth rate of 5.19 is the third-highest of the average growth rate on the island of Sumatra, indicating that although it has a low GRDP value, Lampung Province has the potential to be developed due to good economic growth, strategic geographical position in South Sumatra became one of the supporting factors.

The convergence study focuses on inter-regencies/ cities in Lampung Province and takes an interistic spatial concept of the region in economic development where regional potential and inter-regional relationships are one of the research focuses. This province has economic potential in agriculture and plantations (Bappeda, 2016). The government will increase the allocation of programs/ activities for national food security buffer areas. This is because Lampung Province is also a buffer for national food security and is a large producer of agricultural commodities. This indicates that the Lampung Province between its regions shows an economic potential, especially in the field of agriculture and plantations.

Kuncoro (2004), concludes that differrences in growth rates between regions can be caused by various factors, including the tendency of the role of capital (investors) to choose urban areas or areas that have complete facilities, and the inequality in the distribution of income from the central government to the regions. The Klassen Typology analysis tool is used to describe the pattern and structure of economic growth in each region in Lampung Province. The following is a description of the Klassen typology pattern on average growth and GRDP per capita in Lampung Province in 2015-2019:



Source: Lampung Provincial Statistics Center, SPSS data processed.

Figure 2. Klassen Typology of Economic Structure Pattern in Lampung Province

There are four regional categories from the regional typology results. Fast-developing and fast-growing areas are areas that have higher levels of economic growth and income levels than the average district/ cities. Some areas that have indications are Bandar Lampung City, Central Lampung Regency, South Lampung, Tulang Bawang, and West Tulang Bawang. This quadrant indicates that some less developed districts can catch up with more developed urban areas. Furthermore, the division of developed but depressed areas: namely Metro City, North Lampung and Tanggamus, Fast developing areas: Pesawaran, Pringsewu, Pesisir Barat, West Lampung and Mesuji.

The intrinsic differences in the region make each region able to develop in the economy, this is also reflected in the classification typology which indicates that the regions in Lampung province have a potential economic pattern. The special potential available in each region sometimes becomes the main basis for inter-regional convergence in success in regional development.

The economic growth of a region will be greatly influenced by the development of the surrounding area, especially with the entry of production factors from the surrounding area. In this case, the distance and infrastructure factors will affect the intensity of interaction between

regions. So that the success of the development of an area in essence cannot be claimed as the success of the area itself.

The representation of the pattern of economic growth will be examined by adding an analysis of spatial effects. Anselin added a view of deep spatial effects so that it became an inseparable part of empirical theory and practice. Spatial discussion becomes more interesting because of the availability of more and more geo-referenced data and easy-to-use technology to manipulate it in geographic information systems. Equally important, however, is the growing attention to spatial perspectives driven by important shifts in theoretical focus. It provides a new theoretical perspective for analyzing phenomena, such as peer effects, environmental effects, spatial spillovers, and network effects (Anselin, 2010).

The involvement of spatial effects is used to see how economic activity is between regions, the importance of the effect of neighboring regions on the growth of a region cannot be ignored because interactions between regions must occur, one of which is with areas that are close to each other. The emergence of inter-regional cooperation can benefit in the form of synergies from the interactive growth of cities or other areas.

The absolute hypothesis of convergence will play a role in whether in this study a divergence or convergence is taking place in poor and rich regions, the economy is marked by the per capita GRDP of a region, according to economic data in the Lampung province, several developing regions regardless of the central region or low per capita GRDP has a relatively higher rate of growth center. The focus of the conjecture in the study is formed and problem-solving will focus on how is the spatial relationship of per capita GRDP between 15 districts/ cities in Lampung Province and whether there is absolute beta convergence of per capita GRDP.

METHOD

This type of research is descriptive quantitative research and the source of the data used is secondary data which is obtained indirectly and obtained from agencies in various research areas. Overall the data used in this research is time series data (time series) in the period 2015-2019 and data cross (cross section) of 15 districts and cities in Lampung with statistical processing of data through Eviews program. In this study, secondary data was obtained from the Central Statistics Agency and other publications containing data between 15 regencies and cities in Lampung Province. The variables used in this study were GRDP per capita in the study period and GRDP per capita in the previous period in million Rupiahs. Per capita, GRDP explains the amount of added value generated for all business and service areas in a region, the entire value of final goods and services produced by all economic units, and then accumulated in the number of residents of a region.

In this research, the Geographic Information System is used using the Geoda software application where this application collects, prepares, and stores spatial data from spatial calculations carried out by entering the results of spatial calculations. data input and spatial data management and the composition or layout of the spatial map, illustrated with GeodaMap in accordance with the input data of the magnitude of the spatial value of GRDP per capita between 15 regencies and cities in Lampung Province in 2015-2019.

The Global Moran Index is a statistic that is used to determine regional linkages in general (Anselin, 2010). Calculation of the global Moran Index using a standardized W spatial weighting matrix is formulated with the following formula:

$$I = \frac{N \sum_{i=1}^{n} \sum_{j=1}^{n} w_{if} (X_i - \bar{X})(X_j - \bar{X})}{\sum_{i}^{n} \sum_{j}^{n} w_{if} \sum_{i=0}^{n} (x_i - \bar{x})^2} \quad (1)$$

Where I is the Global Moran Index among 15 districts/ cities in Lampung Province, n; number of observation locations/ total observation area, X; the average value of GRDP per capita, i; value of GRDP per capita of each research area, j; the total value of GRDP per capita in all research areas, Wij; the value of the spatial weighting matrix between the research areas.

The Moran's I index has the following expected values and variances:

$$E(I) = -\frac{1}{n-1} \quad (2)$$

$$Var(I) = \frac{n^2 S_1 - nS_2 + 3(C)^2}{(C)^2\ (n^2-1)}$$

$$C = \sum_{i=1}^{n} C \sum_{J=1}^{n} C_{ij}$$

$$S_1 = \frac{\sum_{i=1}^{n} C \sum_{J=1}^{n} (C_{ij}+C_{ji})^2}{2} \quad (3)$$

Where n; the number of observation locations across 15 districts/ cities in the province of Lampung, i; values on the location of district/ city i among 15 districts/ cities in Lampung Province, j; the value at the location of district/ city j among 15 districts/ cities in Lampung Province, C_{ij}; matrix elements Contuguity, C_i; total value of the line to 1 Matrix Contuguity, C_j; total value of the column to the first Matrix Contuguity, E (I); expected value of Moran's I index, Var(I); the variance of the Moran's I index.

To determine the level of significance and relevance of existing regions, it can be tested on the resulting Moran's I index output. The hypothesis is as follows:

Ho: (I) 1 = 0, (no relationship between regions)

Ha: (I) 1 = 0, (there is a relationship between regions)

The test statistic used is:

$$Z(I) = \frac{I - E(I)}{\sqrt{Var(I)}} \quad (4)$$

This formula indicates the moran index to be calculated and the z value test to be compared with the z table value, where i; is the result of the moran index, z(i); the value of the moran index statistical finding, e(i); expected value of moran index and var(i); variation of moran index value.

Spatial statistical rules by comparing the value between Z table and arithmetic, the value of Z(I) > Zα or less than -Zα, then the conclusion is that these statistical figures have a significant and significant spatial autocorrelation in, Moran's I index value is in the range (-1.1). If I positive indicates grouping of characteristics of the same value, if I negative indicates grouping of different characteristics and while if the finding of I is zero then there is no spatial relationship.

Local Indicator of Spatial Association (LISA) is a follow-up step that is used as a result of area specifications to be displayed on the map, (Anselin, 1995), has requirements that must be met, LISA findings in the form of a map containing spatial statistics on each observation must be able to show significant spatial clustering around the main observation with regions having different color outliers and the LISA sum of each local measure for all observations should be proportional to the global measure of the overall Moran index value. The purpose of LISA is to identify local groupings that are spatial outliers. The formulation of the Local Moran Index is as follows:

$$I_i = \frac{(X_i - \overline{X})\sum_{j=1}^{N} w_{ij}\left(Xj - \overline{X}\right)}{\sum_{i=1}^{N}(X_j - \overline{X})^2/N} \quad (5)$$

Where I_i; local moran value between observation areas, n; the total number of observations in the area of observation, X; the average value of the observations across the region, Xi; the value of the observation variable area i Between the observation areas, Xj ; the total value of the observation variable area j between the observation areas and W_{ij}; Spatial weighing element which refers to the location of region i to neighboring region j.

The next tool used is the standardized average of neighbors, this is used to see the relationship between the observed values. Moran scatterplot will divide four quadrants which will produce four types of relationship between an area and the surrounding area as close neighbors (Anselin, 1998).

Quadrant IV High-Low	Quadrant I High-High
Quadrant III Low-Low	Quadrant II Low-High

Source: Geoda, 2021

Figure 3. Morans Index Quadrant Division

According to (Zhukov, 2010), the quadrants in the Moran Scatterplot are as follows: In quadrant I, HH (High-High) describes an area with a high observation value of the variable surrounded by an area that has a high observation value. In quadrant II, LH (Low-High) describes areas with low observation values of the variable surrounded by areas with high observation values. In quadrant III, LL (Low-low) describes areas with low observation values of the variable surrounded by areas with low observation values. In quadrant IV, HL (High-Low) describes an area with a high observation value of the variable surrounded by an area with a low observation value.

Absolute convergence explains how the economy of poor regions tends to grow faster than rich countries. The absolute convergence indicator is the Economic Growth of a region. Absolute convergence can occur if lower-income areas can catch up with high-income areas. Where high-income areas experience steady-stage conditions or economic growth in an area that has reached its maximum limit. So that when a region has reached its maximum economic condition and experienced an increase in population, the region's economic growth will decrease, and regions with lower incomes can pursue income from the region or experience a catching-up effect. To calculate absolute beta convergence, according to can use the equation:

$$lny_{it} = \alpha + \beta_0 lnY_{it-1} + e_{it} \quad (6)$$

Where yit; the GDP per capita 15 districts/ cities in Lampung Province, Y_{it-1}; the GDP per capita 15 districts/ cities in Lampung Province (in the previous year), α; the constant coefficient, β; regression coefficient of each variable, ln; natural logarithms, et ; error terms.

Calculation of the absolute and conditional beta convergence speed in the convergence coefficient in 15 districts/ cities in Lampung Province in 2015-2019, the Convergence Coefficient (b) can be stated as follows (Robert J. Barro et al., 1991):

$$b = -(1 - e^{-\beta T}) \quad (7)$$

The value of the calculation of the speed of pursuing the economic gap between regions and the half-time convergence of chasing the gap by entering the predictor coefficient, the formula becomes:

$$\beta = -\frac{\ln(b+1)}{T} \quad (8)$$

The half-time convergence is:

$$\beta = -\frac{\ln(2)}{\beta} \quad (9)$$

Where b; predictor coefficient lnYit-1 in Absolute 15 districts/ cities in Lampung Province, T; the length of the research year 2015-2019 (5 years), ln; natural logarithm.

RESULTS AND DISCUSSION

Perroux's (1950), view of "space as a force" gives rise to spatial interaction, which defines space as a type of network held together by centripetal forces, has formed the basis of most growth center theories.

There is a spatial relationship of per capita GRDP, throughout 2015-2019 between 15 regencies/ cities in Lampung Province, with a finding value of 0.2645. Positive and significant values indicate a positive autocorrelation which

makes the economic pattern with the same characteristics and groups between regions. Statistically, the spatial value of Z is greater than Zα or less than -Zα , so that the overall result of the value of Z(I) > Z0.95 is 1.9834 > 1.645. The following table presents the results of the relationship:

Table 1. The Moran Index of GRDP Per Capita Among 15 Districts/ Cities of Lampung Province During 2015-2019

Year	Moran's I	E(I)	z-value	p-value
2015-2019	0,2645	-0,071	1,9834	0,0360

Source: Data processed by Open Geoda

The next test was carried out by looking at Moran's I values throughout the research period from 2015 to 2019, which can be seen in the following table:

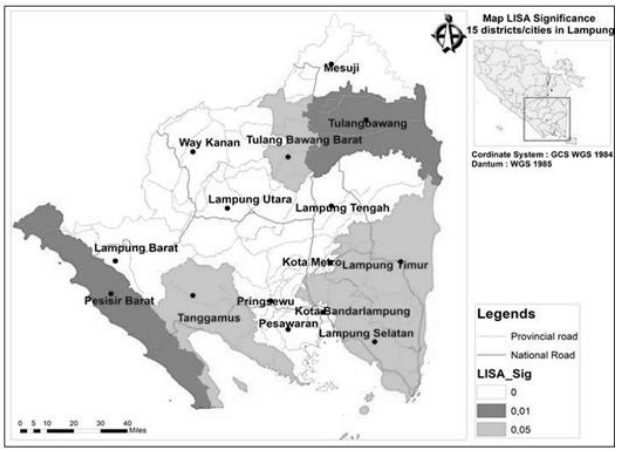
Table 2. The Moran Index of GRDP Per Capita Among 15 Districts/ Cities in Lampung Province in Each Period

Year	Moran's I	E(I)	z-value	p-value
2015	0,3570	-0,071	2,801	0,0100
2016	0,3509	-0,071	2,765	0,0100
2017	0,3487	-0,071	2,751	0,0100
2018	0,3425	-0,071	2,709	0,0100
2019	0,3345	-0,071	2,655	0,0100

Source: Data processed by Open Geoda

The calculation of the results of the Moran'I index is carried out again by looking at the value every year at the time of the research, this is in order to see the statistical results every year. The findings in 2015, 2016, 2017, 2018 and 2019, the Z test showed a critical value of of 5% or Z0.95 = 1.645, Overall the value of Z(I) > 1.645 which means the spatial relationship of GRDP Per capita is positive and significant and have a clustered pattern.

Identification of areas that contribute or receive economic contributions with other regions in the economy can be seen from the results of the LISA significance test, following the results of the LISA map of significance in 15 districts/ cities in Lampung Province:



Source: Data processed by OpenGeoda.

Figure 4. Map of the GDP Per Capita LISA Significance Throughout the Year 2015-2019.

The results of each period of the LISA signification map at a significance level of 0.05 cover 4 regions, namely Tulang Bawang Barat, Lampung Timur, Tanggamus, and South Lampung, at a significance level of 0.01 it covers 2 regions, namely Tulang Bawang and Pesisir Barat. In each research period the LISA Signification results have a regional significance level that tends to be the same every year. The following are the areas of significance with their neighbours:

West Tulang Bawang received contributions from its neighboring areas, namely Mesuji, Tulang Bawang, Way Kanan, North Lampung, Central Lampung.

East Lampung received contributions from its neighboring regions, namely South Lampung, Central Lampung, Tulang Bawang, Metro.

Tanggamus receives contributions from its neighboring regions, namely West Lampung, Central Lampung, Pesawaran, Pringsewu, West Coast.

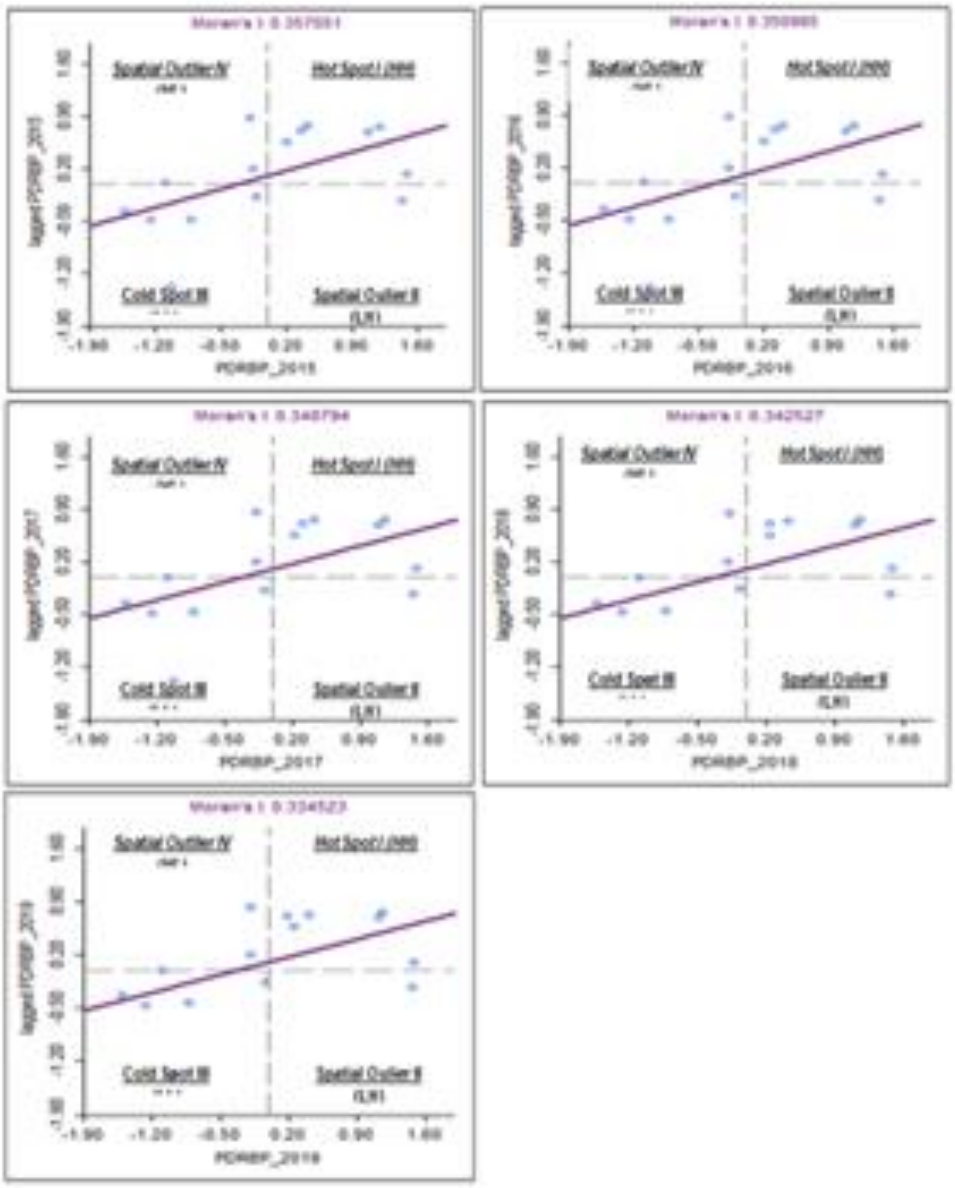
South Lampung received contributions from its neighboring areas, namely Bandar Lampung, Pesawaran, Central Lampung, East Lampung.

Tulang Bawang received contributions from its neighboring regions, namely East Lampung, Central Lampung, Mesuji, West Tulang Bawang.

The West Coast receives contributions from its neighboring area, Tanggamus, West Lampung.

These results indicate that the green areas are areas that receive the spillover effect (spillover) of the economy from other regions, in this case are neighbors between regions. Regional linkages with other regions are important in facilitating the flow of spillovers, the farther the distance between regions, the smaller the possibility of spillovers (Suparta, 2009).

The Moran index test in the form of Moran's Scatterplot can be seen in the figure shown to see the categories of hot spots, cold spots, and spatial outliers. The difference in the amount of GRDP of each districts/city and the magnitude of the influence of the surrounding environment will cause the grouping of related areas to occur. The following are the results of Moran's Scatterplot throughout 2015-2019 (Figure 5).



Source: Data processed by Open Geoda.

Figure 5. Moran's Scatterplot

The district/ cities area will be divided into a Moran scatterplot which will present four quadrants which are the relationship between a region and its neighboring areas along with the results based on the relationship between the GRDP levels between regions. Divided into quadrants moranscaterplot:

Quadrant I (High-high): this quadrant includes the cities of Bandar Lampung, Mesuji, Tulang Bawang, West Tulang Bawang, Central Lampung and East Lampung which have high per capita GRDP values surrounded by areas with high observation values. In this quadrant, 3 regions are included in the Hot Spot quadrant, where this region occurs when an area with a high economic value is surrounded by neighboring regions with a high economic value.

Quadrant II (Low-High): This quadrant covers the area of South Lampung which has a low value per capita GRDP, surrounded by areas with a high observation value. In this quadrant 5 regions are included in the Spatial Outlier quadrant, where this region occurs when an area with a low economic value is surroundedby neighboring regions with a high economic value.

Quadrant III (Low-Low): This quadrant includes North Lampung, Waykanan, Pesisir Barat, Tanggamus, West Lampung and Pringsewu which have low per capita GRDP values surrounded by areas with low observation values. In this quadrant 1 region is included in the Cold Spot quadrant, where this region occurs when an area with low economic value is surrounded by neighboring regions with low economic value.

Quadrant IV (High-Low): This quadrant includes Pesawaran and Metro City which has a high value per capita GRDP, surrounded by areas with low observation values. In this quadrant, 6 regions are included in the Spatial Outlier quadrant, where this region occurs when an area with high economic value is surrounded by neighboring regions with low economic value.

The economic linkages that occur in the district/ cities of Lampung Province cannot be separated from the interaction relationship between regions in carrying out economic activities, the intrinsic differences of the region make a region cooperate with each other in carrying out the economy. Mehrtens and Abdurahman (2007), describe the factors that encourage a collaboration include: the factor of regional limitations (needs): this can occur in the context of human, natural, technological, and financial resources, the factor of similarity of interest: the existence of a common vision of development and enlarging opportunity to gain profit, both financial and non-financial, synergy factor between regions: a growing awareness that cooperation between regions can increase the positive impact of various development activities that were originally a regional power.

The results of the study indicate that linkages result in spatial economic relationship positive interrelated and this indicates that the economy is among the 15 districts/ cities in Lampung province has a similar characteristics in economic development. Economic linkages basically describe the economic relationship between a region and the surrounding environment. The similarity of economic interests in several regions will allow economic cooperation to be established. This cooperation is expected to have a positive impact on the economic development output of these regions (Kuncoro, 2002).

Absolute convergence testing begins with panel data testing, the following is panel data testing:

Table 3. LM Test of Absolute Convergence Panel Data

Test	Statistic	df	Prob.	Conclusion
FEM	28,0143	14,4	0,000	H_o rejected
RM	0,12062	1	0,728	H_a accepted

Source: Eviews Processed data

Based on the results of the Fix Effect/Cow Test, the statistical Chi-square value (28.014333) > Chi-square table (23.685) at df = 14 with a probability level of 0.0000 <0.05, causing Ho to be rejected. The results of the Random Effect/ Husman Test obtained a statistical Chi-square value (0.10628) < Chi-square table (3.841) at df = 1 with a probability level of 0.7284> 0.05, thus causing Ha to be accepted. So the Fixed Effect model is the model that should be used.

Absolute convergence model in which the previous year's GRDP per capita is the only explanatory variable for GRDP. Following are the results of absolute convergence regression of 15 districts/ cities in Lampung Province, the following results are obtained:

Table 4. Estimation Results of Ordinary Least Square (OLS) Absolute convergence.

Variable	Coeff	Std. Error	t-Stat	Prob
C	11,678	1,300	8,981	0,000
LnYit-1	-0,277	0,076	-3,616	0,000

Source: Eviews processed data

lnYit = 11.67828 -0.277517lnYit -1
R2 = 0.869382
F-stat = 26.17996
DW = 1.117118

The results of the regression estimation in the table, it can be seen that the coefficient of GRDP per capita in the previous year showed a negative value of -0.2775, the value and significant at = 0.05 had a significant effect, which means Ho is rejected, this shows the direction to the absolute process of convergence between 15 districts/ cities in Lampung Province for the 2015-2019 period. The R2 value of 0.869382 means that 86.9% of the variation in the rise and fall of GRDP is influenced by the GRDP of the previous year. Indications of lower per capita GRDP growth are able to grow faster than districts and cities in Lampung Province whose initial conditions are better, and are able to catch up with the achievement of areas with higher GRDP growth.

Estimated between the GRDP per capita of a certain year and the GRDP of the previous year, the predictor coefficient is the coefficient of the GRDP at the beginning of the period at absolute convergence which is - 0.277517 and then that number is entered into the formula to find the beta convergence value, which is equal to:

$$\beta = \frac{\ln(0,277517+1)}{5}$$

$$\beta = \frac{0,244918}{5} = 0,048983 \quad (10)$$

The indication of the beta convergence value is 0.048983 or 4.8%, the gap that can be worked out between the previous year's GRDP per capita conditions and steady state GRDP conditions within 1 year. This figure is also a measure of the speed at which the economic gap is closing. The catch-up process among 15 regencies/ cities in Lampung Province is ongoing. From the absolute beta convergence value of 0.048983, it can be seen that the half-life convergence, namely the time required to close the initial gap, will be achieved:

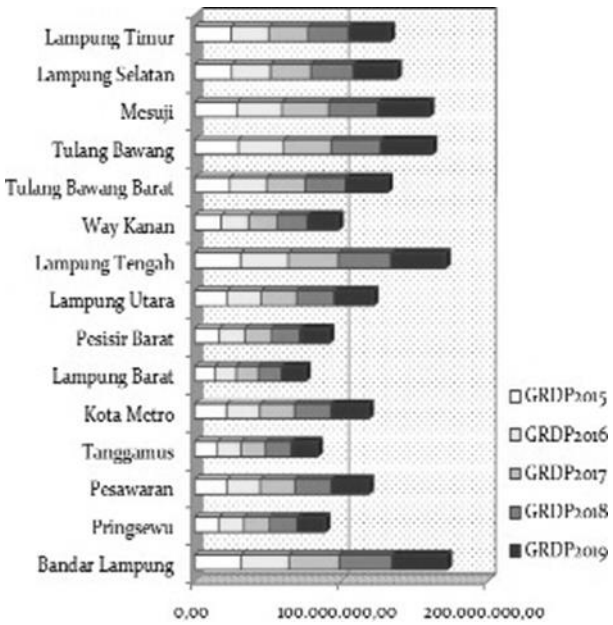
T=In(2)/β
T=0,6931/0,048983
T= 14,17 (11)

The time needed to close the gap from the initial gap is 14.17 years. It takes approximately 14 years to catch up the GRDP per capita gap that occurs between provinces and 15 districts/cities in Lampung Province.

The previous year's GRDP and GRDP in the research year became the outline in determining absolute convergence. The Lampung province's economy from the findings of spatial linkages showed the same economic pattern and interrelatedness between regions in districts and cities in Lampung Province. This similarity makes economic activities mutually cooperate between regions in order to promote the economy between regions and interact in a profitable manner.

According to (X. X. W. Sala-i-Martin, 1995), regions having the same system and institutions tend to have relative homogeneity, this supports the application of absolute convergence for studies between regions within one country. The state of homogeneity in the state of the system and economic institutions tends to cause convergence to occur in a certain area.

The development of GRDP per capita on the basis of Constant Prices in 15 districts/ cities in Lampung Province shows the overall economic growth rate/each sector from year to year and as an illustration of the average income received by each resident for one year in a region, as well as an indicator of prosperity. This is reinforced by data on the movement of GRDP per capita of 15 districts/ cities in Lampung Province every year which continues to increase between regions, the following is a picture of GRDP per capita throughout the period:



Source: BPS, data processed.

Figure 6. Condition of the GDP Per Capita 15 Districts/ Cities in Lampung Province During the Year 2015-2019 (Million)

In the early 2015 to 2019 period, the GRDP per capita between regions continued to show positive things with continued increases every year. The dominance of the increase in the regency which continued to increase continued between the 2015-2019 period. Almost catch up to the growth center area which is Bandar Lampung City. Thus the GDP in aggregate demonstrates the ability of a region to generate revenue and production factors which participate in the production process in 15 districts/ cities in the region.

This is also an assumption in the form of an area in Lampung province that continues to develop and advance the economy through the intrinsic state of their respective regions by utilizing the advantages of regional economic. Conditions which are supported by the presence of natural resource factors, especially the agricultural, plantation and fishery sectors which spread and have the potential to help the movement of GRDP between regions.

The progress and utilization of potential sectors in each region that has a lower per capita GRDP indicate that it is happening and continues to move the wheels of the economy in each region so that the strengthening of internal factors (endogenous) will attract positive externalities as growth spillovers between regions. An important role in this process is also inseparable from the availability of production factors in the economy in the province of Lampung. Existing district areas tend to approach the economic growth of growth center areas in districts and cities in Lampung Province, this is indicated by the growth rate of areas that have low GRDP but growth rates are higher than growth centers.

Robert J. Barro et al. (1991), convergence is stated to occur if the poor economy grows faster than the rich economy because the economies of rich countries can implicitly be declared to have exploited the capital they have, so their growth rates tend to experience a slowdown. And conversely, the economy of poor countries can implicitly be stated to have not optimized the use of capital, so they can still enjoy a return of capital stock exceeding what can be enjoyed by rich regions at the same time, so that their

economies (poor regions) tend to grow faster than those of rich regions rich regional economy.

Manzi (2009), the convergence process that occurs throughout Europe, with an estimated convergence speed of about 2%. We find evidence of a positive effect of TLC and transport infrastructure on economic growth, over the same period transport infrastructure improves at a much lower rate, considers the problem of spatial correlation and corrects biases with econometrics, and estimates the spatial model.

Rivas & Villarroya (2017), Convergence results between OECD countries, there are different groups in per capita income. Parameters representing the convergence hypothesis show negative coefficients in each case. These results reveal faster convergence between countries belonging to the upper and developing groups. In addition, 1960–1970 was highlighted as a period in which convergence was more intense. The tendency of developing countries with existing potential has the power to achieve convergence.

CONCLUSION

The spatial autocorrelation of GRDP per capita between 15 regencies/ cities in Lampung Province in 2015-2019, shows that there is a spatial relationship in the form of a positive spatial autocorrelation which is quite strong and spatially there is a formation of a spatial pattern of grouping regions that have an economy with indications of the same characteristics. In the absolute convergence of the previous year's GRDP to the GRDP of the research period in Lampung Province in 2015-2019, it has a negative relationship with a coefficient value of -0.277517. Indications of the speed of reducing the economic gap by 4.8%, so the time required in a process of reducing the gap from the initial gap is 14.17 years.

Areas around the central region are proven to converge at one time if the economy is managed by prioritizing the intrinsics of a region, the potential of a poor region must be developed consistently in order to support per capita GRDP. Spatial effects are now an important part when we have to focus more on looking at the economy regionally, where the economy is in a space in the form of a region and time period. Spatial effects are proven to analyze that cooperation between regions has an important role in economic activity.

The next study focuses more on including the variables of production factors between supporting regions, but still includes spatial analysis as the key that each region has activities and cooperates with each other. The spatial relationship of the economy is an important consideration in a policy that focuses on the role of regions in the regional economy.

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