Conference Paper

Analysis of Pre-post Covid-19 Influence in Bangka Belitung Islands Province: Socio-Economic Aspects in 7 Regencies/Cities

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Abstract.
This study will analyze the variables of economic growth, poverty rate, unemployment rate, and the Human Development Index using situational trend analysis of the 4 factors before - after Covid-19 and spatial autocorrelation to see the inter-regional linkages as well as the distribution pattern of the observed data. The purpose of the study was: 1) to find out the description of the situation of the 4 factors before – after Covid-19; and 2) knowing the spatial autocorrelation based on Moran's index with the spatial weighting matrix (WIJ). Based on the results of the analysis, the rate of economic growth in each district/city of Prov. Bangka Belitung tends to have a downward trend in the period 2018–2020 except Kab. Bangka and Pangkalpinang City. The variable rate of economic growth also did not have a spatial autocorrelation during the 2018-2021 period, which was indicated by the distribution pattern of the 2018-2019 data spreading (the Moran index was negative) and 2020-2021 was clustered (the Moran index was positive). Unemployment variable in all districts/cities of Prov. Bangka Belitung had a significant upward trend in the 2018-2021 period. The variable percentage of unemployment also did not have a spatial autocorrelation, which was indicated by a data distribution pattern that spreads over the 2018-2021 time period. The poverty variable in all districts/cities of Prov. Bangka Belitung had a downward trend in the 2018-2021 period. The variable percentage of poverty also does not have a spatial autocorrelation, which was indicated by a data distribution pattern that spreads over the 2018-2021 observation period (the Moran index was negative). Variable Human Development Index in all regencies/cities prov. Bangka Belitung has an upward trend during the 2018-2021 timeframe. The HDI variable also does not have a spatial autocorrelation, but the data distribution pattern tends to collect during the 2018-2021 time period (positive Moran index).

Keywords: economic growth, poverty, unemployment, human development, spatial autocorrelation, Covid 19

1. Introduction

Sustainable economic development is very necessary in order to improve the level of community welfare. This can be seen from the stability of a region's economic growth [1]. The rate of economic growth is one of the national development targets in Indonesia, especially to analyze the results of economic growth and create economic equity. An

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increase in economic growth is considered successful if the production of goods and services increases compared to the previous year or vice versa [2]. Economic growth is basically a long-term macro-economic problem that aims to increase real output (national income) and living standards (real income per capita) by covering 3 factors, a) capital; b) manpower; and c) production [3].

Economic growth and labor have a close relationship, this is due to the negative relationship between economic growth and unemployment, namely the higher the unemployment rate, the lower the economic growth rate [4]. Article 36 of Law no. 19 of 2012 mandates that every 1% of economic growth can absorb around 450,000 workers. Unemployment is a serious problem in Prov. Bangka Belitung with the unemployment rate is quite fluctuating every year, this is because the job system is starting to change. The unemployment rate is also influenced by several other indicators, including economic growth, poverty rates and the human development index [5].

Poverty occurs due to slowing economic growth and even decreasing every year and the low quality of human resources, causing the unemployment rate to increase. Poverty is still a complicated problem compared to other indicators of economic growth. This is because the problem of poverty is closely related to social, economic, cultural and other aspects [6].

One of indicator that intersects and is closely related to economic growth, poverty and unemployment is the Human Development Index. HDI is used to measure the development of an area through several aspects which include Health, Education and the economy. In general, HDI is negatively correlated with poverty and unemployment rates but positively correlated with economic growth. The linkage between these factors is because if economic growth increases, the HDI value will be higher and if the unemployment and poverty rates increase, then the HDI value will decrease [7].

Based on the explanation above, this study will analyze the variables of economic growth, poverty rate, unemployment rate and HDI using situational trend analysis of the 4 factors before - after Covid-19 and spatial autocorrelation to see the interrelationships between regions as well as the distribution pattern of the observed data. The purpose of the study was to 1) find out the description of the situation of the 4 factors before – after covid 19; and 2) knowing the spatial autocorrelation based on Moran's index with the spatial weighting matrix (w_{ij}).

2. Methods

2.1. Data and research resources

The population used in this study is social and economic data in the Province. Bangka Belitung while the sample of this study includes data on the unemployment rate, economic growth, poverty cases and the human development index in Bangka Belitung Province in 2018 - 2019. The type of sampling used in this study is purposive sampling, because the variable data used is based on certain criteria.

The data in this study used data from the publications of BPS Prov. Bangka Belitung and BPS for each district/city with a time span of 2018 – 2021. There are 4 variables used, including: Unemployment Percentage (X1), Economic Growth Rate (X2), Percentage of Poor Population (X3) and Human Development Index (X4).

2.2. Study area

The object of this research is in Bangka Belitung Island Province, Indonesia which has coordinates 104˚50' to 109˚30' East Longitude and 0˚50' to 4˚10' South Latitude. The total area of Bangka Belitung Province is 81,725.06 Km with 7 districts/cities.
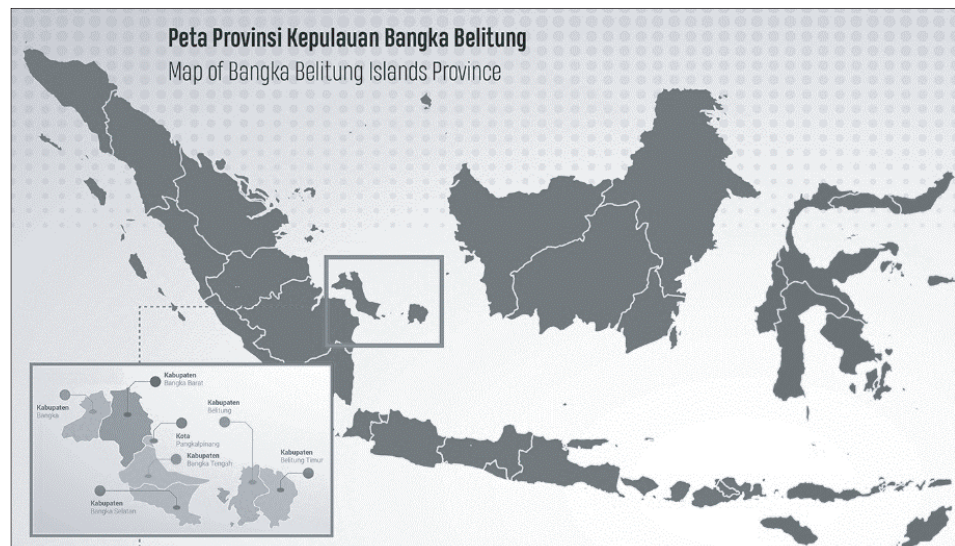
Figure 1: Map of Bangka Belitung island province.

Typology in Prov. Bangka Belitung is formed by highlands, valleys with several hills. Geographical conditions are also divided into a cluster of two islands, Bangka and Belitung with surrounding islands. The hilly area is in Kab. Bangka, West Bangka and Belitung with an altitude between 395-699 meters above sea level, while the lowlands in other districts/cities have an average height of about 50 meters above sea level. This physical condition affects the availability of public facilities, population distribution and

economic activities. Most of the lowlands, highlands, and hills have slightly different public facilities to support human activities. This phenomenon affects the level of development of each region.

2.3. Descriptive statistics

Descriptive statistics is a method of collecting and presenting data to provide useful information [8]. This method aims to provide an overview or description of the data in general, so that the data presented can be understood and informative for those who read it. Examples of data presentation in descriptive statistics can be in the form of tables, graphs, charts, and numerical summaries of data. Descriptive statistics also describe various data characteristics such as the average (mean), standard deviation, variance (variance), range of values (range), minimum and maximum values.

2.4. Spatial autocorrelation

Spatial autocorrelation is a measure of the similarity of variable values located within a geographic area indicating a measure of the similarity of objects that have similar patterns [9]. The step in determining the spatial autocorrelation is to create a spatial weighting matrix. The spatial weighting matrix is based on the neighboring elements of an area marked by a tangent to an area. Broadly speaking, the neighbors of a location use movements in a chess game with several kinds [10]:

1. Rook Contiguity, Neighborhood according to rook contiguity can occur when two neighboring areas if each of them are tangent to each other at the boundary of each side.

2. Bishop Contiguity, Neighborhood according to Bishop contiguity can occur when two regions meet at one point. This is an application of the spatial analog of two elements where a graph meets at a vertex.

3. Queen Contiguity, is a combination of rook contiguity and bishop contiguity. Neighbors according to queen contiguity can occur when two areas are tangent to each other on each side boundary or at one vertex.

2.5. Moran index

Moran's index (Moran's I) is a measure of global autocorrelation which is an extension of the Pearson correlation coefficient and is symbolized by I [11]. Moran index is a method in spatial analysis to calculate the spatial relationship that occurs in a space [12].Spatial autocorrelation calculation using the Moran Index with a weighted matrix in the form of normality or a standardized matrix defined in the following equation:

$$I = \frac{n}{\sum_{i=1}^{n}\left(y_i - \overline{y}\right)^2} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(\left(y_i - \overline{y}\right)\left(y_j - \overline{y}\right)\right)}{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}}$$

Where,

n : unit observations (locations)

y_i : observation value at location to-i

y_j : observation value at location to-j

$\overline{y}$: average value on observations n locations

w_{ij} : matrix weight value between locations to-i and j

The range of values of the Moran index in the standardized spatial weighting matrix exists $-1 \leq I \leq 1$. value $-1 \leq I \leq 0$ indicates a negative spatial autocorrelation while the value of $0 \leq I \leq 1$ indicates a positive spatial autocorrelation [13].

2.6. Moran scatterplot

Moran Scatterplot is one way to interpret Moran index statistics [14]. Moran Scatterplot is a tool used to see the relationship between standardized observation values and the standardized average values of neighboring areas [15]. The point in the Moran scatterplot observation area represents an area that has observed values according to its quadrant and neighboring locations.

TABLE 1: Moran scatterplot quadrant.

Quadrant II (HL)	Quadrant I (HH)
Quadrant III (LL)	Quadrant IV (LH)

In the Moran Scatterplot, locations in the HH (quadrant I) and LL (quadrant III) quadrants will tend to have positive spatial autocorrelation values (data gathered). Meanwhile, locations in the HL (Quadrant II) and LH (Quadrant IV) quadrants will tend to have negative spatial autocorrelation values (data spread).

2.7. Research framework

This research begins by processing raw data sourced from BPS into processed data to generalize the units used in the study. Descriptive statistics are used to describe and analyze data in general. The mapping of each variable per district/city is carried out to obtain a visualization of the results of observations in 2018 - 2021 (divided into before covid-19 and after covid-19). The mapping visualization that was done previously will be processed into trend analysis because the data contains time series, so that it can determine the positive or negative trendline in the data for each processed variable. Moran index and Moran scatterplot are independent analysis of the previous analysis, Moran index is used to determine whether there is spatial autocorrelation or not, while Moran scatterplot is used to analyze and classify the distribution of existing data. Further illustrations of the research flow are shown in the image below.
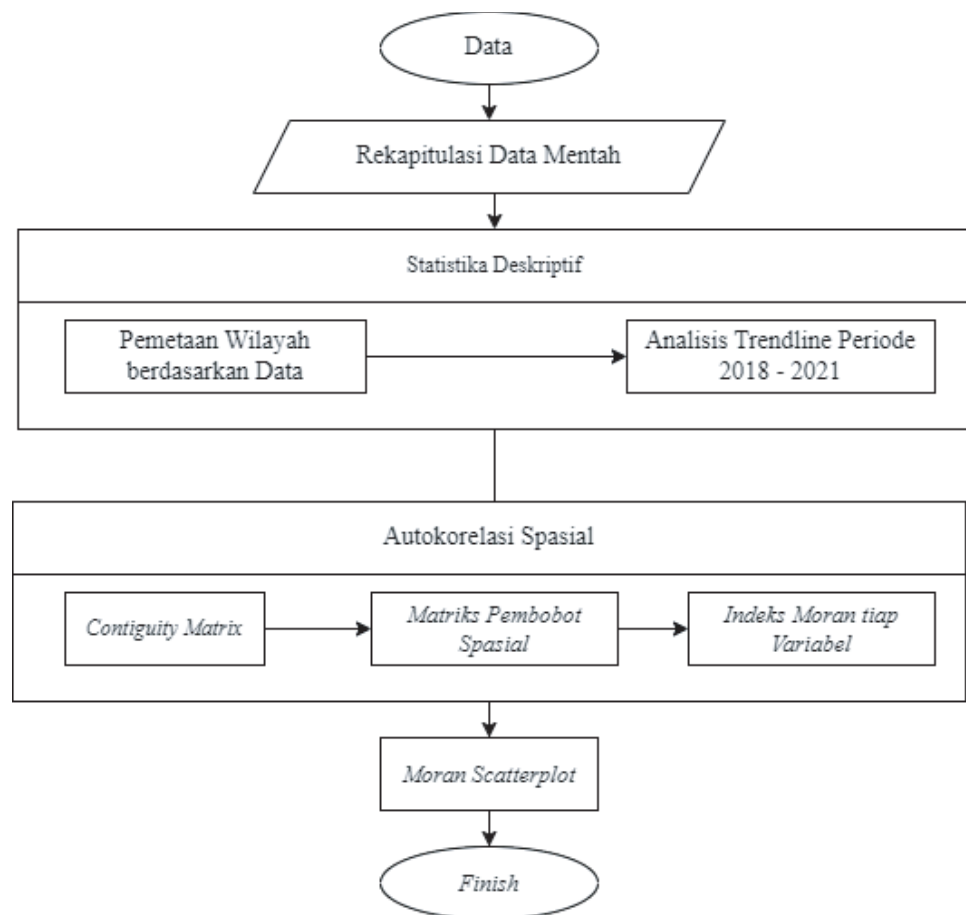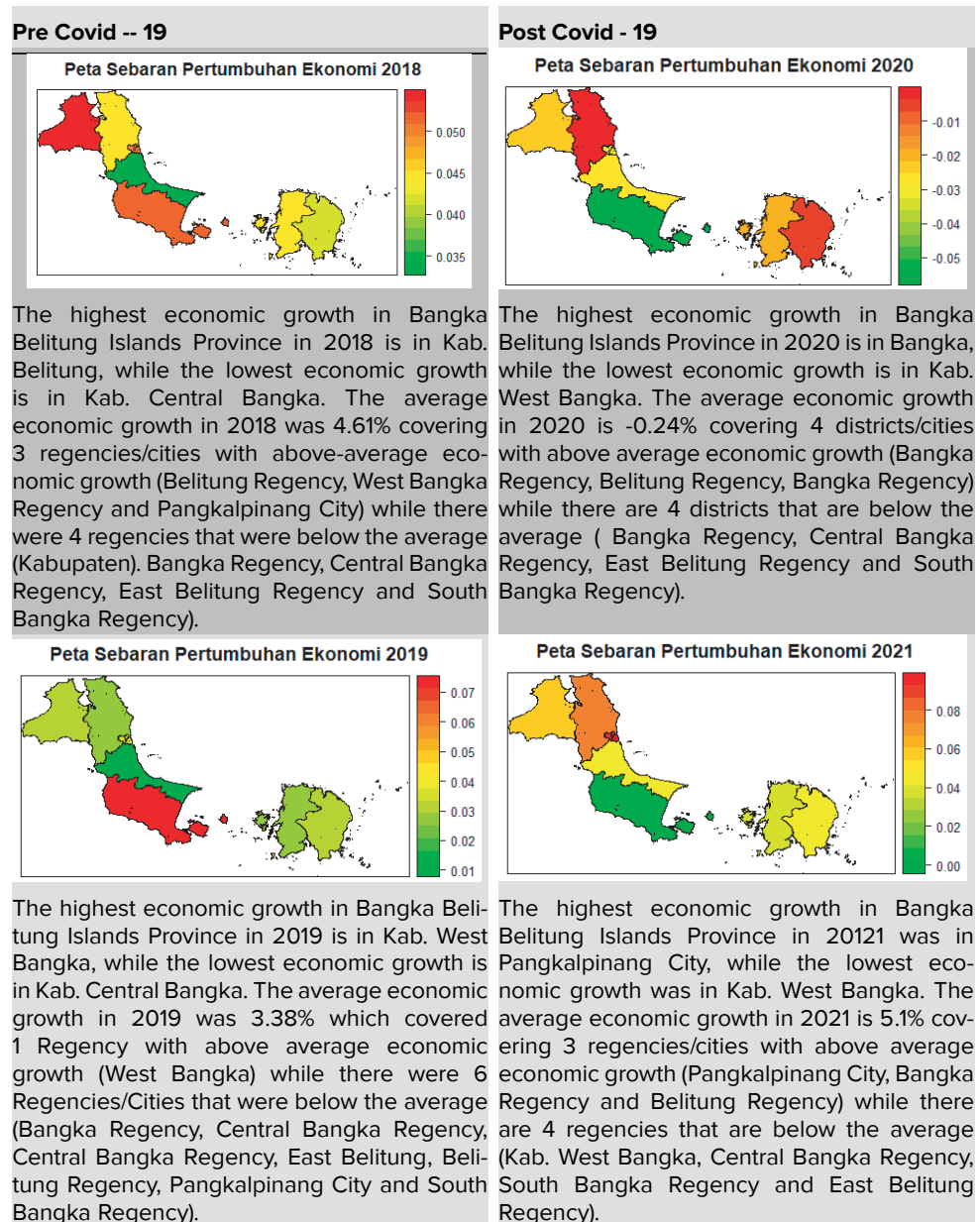

Figure 2: Research framework.

3. Results and Discussion

3.1. Economic growth 2018 -- 2021

Table 2 shows the economic growth of 2018-2021.

TABLE 2: Economic growth visualization.

Pre Covid -- 19	Post Covid - 19
Peta Sebaran Pertumbuhan Ekonomi 2018	Peta Sebaran Pertumbuhan Ekonomi 2020
The highest economic growth in Bangka Belitung Islands Province in 2018 is in Kab. Belitung, while the lowest economic growth is in Kab. Central Bangka. The average economic growth in 2018 was 4.61% covering 3 regencies/cities with above-average economic growth (Belitung Regency, West Bangka Regency and Pangkalpinang City) while there were 4 regencies that were below the average (Kabupaten). Bangka Regency, Central Bangka Regency, East Belitung Regency and South Bangka Regency).	The highest economic growth in Bangka Belitung Islands Province in 2020 is in Bangka, while the lowest economic growth is in Kab. West Bangka. The average economic growth in 2020 is -0.24% covering 4 districts/cities with above average economic growth (Bangka Regency, Belitung Regency, Bangka Regency) while there are 4 districts that are below the average (Bangka Regency, Central Bangka Regency, East Belitung Regency and South Bangka Regency).
Peta Sebaran Pertumbuhan Ekonomi 2019	Peta Sebaran Pertumbuhan Ekonomi 2021
The highest economic growth in Bangka Belitung Islands Province in 2019 is in Kab. West Bangka, while the lowest economic growth is in Kab. Central Bangka. The average economic growth in 2019 was 3.38% which covered 1 Regency with above average economic growth (West Bangka) while there were 6 Regencies/Cities that were below the average (Bangka Regency, Central Bangka Regency, Central Bangka Regency, East Belitung, Belitung Regency, Pangkalpinang City and South Bangka Regency).	The highest economic growth in Bangka Belitung Islands Province in 20121 was in Pangkalpinang City, while the lowest economic growth was in Kab. West Bangka. The average economic growth in 2021 is 5.1% covering 3 regencies/cities with above average economic growth (Pangkalpinang City, Bangka Regency and Belitung Regency) while there are 4 regencies that are below the average (Kab. West Bangka, Central Bangka Regency, South Bangka Regency and East Belitung Regency).

Economic growth trendline 2018 – 2021
Economic growth trendline 2018-2021 is can be seen in Figure ??.

The rate of economic growth in Bangka Belitung Province in each district/city has a graph that fluctuates and tends to decline in the 2018 - 2020 period, then increases again in 2021. However, if we look further based on the trendline of economic growth in each district / city in Belitung Province, then it can be divided into 2 different trendlines namely Uptrend and Downtrend. Bangka Regency and Pangkalpinang City have an
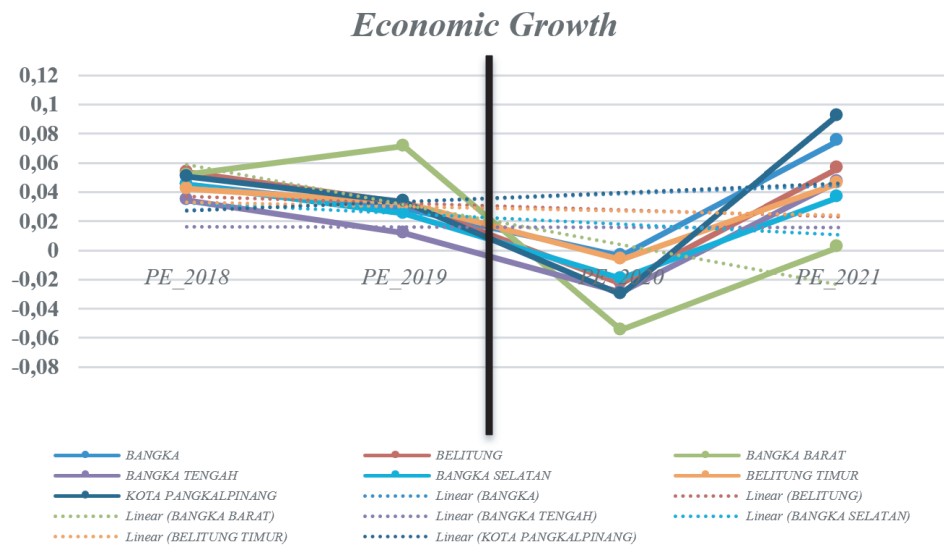
Figure 3: Economic growth trendline 2018 – 2021.

uptrend (positive trendline) in the 2018-2021 period, and the opposite is true for Kab. South Bangka, Kab. Belitung, Kab. East Belitung, Kab. Belitung, Kab. West Bangka and Kab. Middle which has a downtrend (negative trendline) in the 2018-2021 period.

3.1.1. Spatial autocorrelation

TABLE 3: Moran index economic growth.

	Moran Index	E(I)	Var(I)	Z(I)
PE_2018	-0.5018181	-0.166667	0.1310841	-0.92569
PE_2019	-0.4958494	-0.166667	0.0636686	-1.3046
PE_2020	0.1296042	-0.166667	0.1207173	0.85272
PE_2021	0.2464692	-0.166667	0.1266178	1.161

The results of the above calculations are used to identify the presence of spatial autocorrelation using the value of Z(I). The hypothesis test is as follows.

1. H_0: There is no spatial correlation

2. H_1: There is spatial correlation

Critical area α = 0.05

Critical Area: Reject H_0 if *p-value* < α or Z(I) > Z_α

Test and decisions statistics

By using a 95% confidence level, the existing data failed to reject H0 because the value of Z(I) < Zα, so it can be concluded that there is no spatial autocorrelation. This is

<div align="center">TABLE 4: Statistic test of economic growth.</div>

	P-Value	Z(I)	α and Z_α	Decisions
PE_2018	0.8227	-0.92569	0.05 and 1.64	Refuse H_0
PE_2019	0.904	-1.3046	0.05 and 1.64	Refuse H_0
PE_2020	0.1969	0.85272	0.05 and 1.64	Refuse H_0
PE_2021	0.1229	1.161	0.05 and 1.64	Refuse H_0

also evidenced by p-value > then it fails to reject H0. The Moran index value in 2018 and 2019 respectively was -0.5018181 and -0.4958494 in the range -1 < I 0 which indicates that there is no similarity between regions and the data tends to spread out, while in 2020 and 2021 the Moran index value, respectively, is 0.1296042 and 0.2464692 are in the range 0 < I 1, which indicates that there are similar values between regions and the data tends to be clustered.

3.1.2. Moran plot interpretation

The following are the results of the distribution of observational data for each location on each Moran plot for the variable economic growth:

4. Conclusion

Based on the analysis which includes 4 variables (economic growth, poverty rate, unemployment rate and HDI), the conclusions are as follows.

Based on the results of the analysis, the rate of economic growth in each district/city of Prov. Bangka Belitung tends to have a downward trend in the period 2018 – 2020 except Kab. Bangka and Pangkalpinang City. The variable rate of economic growth also does not have a spatial autocorrelation during the 2018-2021 period, which is indicated by the distribution pattern of the 2018-2019 data spreading (the Moran index is negative) and 2020-2021 is clustered (the Moran index is positive).

Based on the results of the analysis, the percentage of unemployment in all districts/cities of Prov. Bangka Belitung has a significant upward trend in the 2018-2021 period. The unemployment percentage variable also does not have a spatial autocorrelation which is indicated by a data distribution pattern that spreads over the 2018-2021 time period (the Moran index is negative).

Based on the results of the analysis, the percentage of poverty in all districts/cities of Prov. Bangka Belitung has a downward trend in the 2018-2021 period. The variable percentage of poverty also does not have a spatial autocorrelation which is indicated

TABLE 5: Moran plot of economic growth.

Pre Covid-19			Post Covid - 19		
2018	Quadrant II (Spatial Outlier / LH)	Quadrant 1 (Hot-Spot / HH)	2020	Quadrant II (Spatial Outlier / LH)	Quadrant 1 (Hot-Spot / HH)
	Kab. Bangka Tengah, Kab. Bangka dan Kab. Belitung Timur	Kab. Belitung		Kota Pangkalpinang	Kab. Belitung dan Kab. Bangka Selatan
	Quadrant III (Cold-Spot / LL)	Quadrant IV (Spatial Outlier / HL)		Quadrant III (Cold-Spot / LL)	Quadrant IV (Spatial Outlier / HL)
	Kab. Bangka Selatan	Kota Pangkalpinang dan Kab. Bangka Barat		Kab. Bangka Selatan	Kota Pangkalpinang dan Kab. Bangka Barat
2019	Quadrant II (Spatial Outlier / LH)	Quadrant 1 (Hot-Spot / HH)	2021	Quadrant II (Spatial Outlier / LH)	Quadrant 1 (Hot-Spot / HH)
	Kab. Bangka Tengah, Kab. Bangka Selatan dan Kab. Belitung			Kab. Bangka Tengah	Kab. Belitung, Kab. Bangka dan Kota Pangkalpinang
	Quadrant III (Cold-Spot / LL)	Quadrant IV (Spatial Outlier / HL)		Quadrant III (Cold-Spot / LL)	Quadrant IV (Spatial Outlier / HL)
	Kab. Bangka, Kab. Belitung Timur dan Kota Pangkalpinang	Kab. Bangka Barat		Kab. Bangka Barat, Kab. Bangka Selatan dan Kab. Belitung Timur	

by a data distribution pattern that spreads over the 2018-2021 observation period (the Moran index is negative).

Based on the results of the analysis, the HDI values in all districts/cities prov. Bangka Belitung has an upward trend during the 2018-2021 timeframe. The HDI variable also does not have a spatial autocorrelation, but the data distribution pattern tends to collect during the 2018-2021 time period (positive Moran index).

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