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The Spatial Analysis of Female Voters' Behavior

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Abstract. The purpose of this study is to find out what factors influence the behavior of female voters. This study was carried out in the city of Tanjungpinang, Riau Archipelago (*Kepulauan Riau*) Province, Indonesia. A number of questionnaires were distributed to obtain female voters' perspective related to the 2014th legislative election. Spatial visualization showed that two factors competed to dominate the behavior of female voters, namely ideology similarity and candidate's religiosity. The results of spatial analysis based on Global Moran's *I* and Local Indicator of Spatial Association (LISA) showed that ideology similarity factor was spread uniformly and did not have spatial association. On the other hand, candidate's religiosity factor formed some patterns of spatial associations. These findings are intended to contribute the study of women's participation in politics through the application of spatial data analysis

Keywords: Female Voters, Election Behavior, Spatial Analysis

1 Introduction

Indonesia's democratic system provides equal space for citizens to obtain their political rights regardless their gender. To enhance the participation of women in political area, the central government has endorsed the Law on Elections No. 12/2003. This law urges the quantity of 30% as the minimum number for women representative in every levels of people council [1]. However, men still dominate the realm of Indonesian politics. This phenomenon occurs not only in the capital area but also in its subordinate region. For instance, in the City of Tanjungpinang, Province of Riau Archipelago (*Kepulauan Riau*) where the number of female voters surpass the men voters in every general election, yet, the number of women legislators are still less than 30% in both city and province representative councils.

Considering this situation, this study aims to examine the women's political vote behavior. To simplify this study, we limit the area of research in the City of Tanjungpinang. We also set the Tanjungpinang's 2014 general election as the time frame. Primary data collected will then be visualized and analyzed in geographical framework. By this study, we expect to know what factors dominate the behavior of female voters in Tanjungpinang's general election and their relation in spatial framework.

2 Literature Review

Based on our literature study, numerous researches have been carried out on the political behavior of female voters. However, it was very tough to find any particular paper that focus on utilizing spatial analysis on female voters' behavior. On the other hand, we found some valuable studies employing spatial analysis on general elections or voters [2][3][4][5]. The methods applied in those studies were concentrated on finding spatial association of measured political objects in an interconnected space.

The spatial analysis is started with ¹³ spatial association test on the variable to be measured. This is obtained by calculating the Global Moran's index (or Global Moran's I) [6]:

$$I = \frac{n \sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^n \sum_{j=1}^n w_{ij} \sum_{i=1}^n (x_i - \bar{x})^2} \quad (1)$$

where n is total number of observed area, w_{ij} is spatial weighted parameter for the pair of area i and j that represents proximity, x_i is the value of a measured variable for observed area i , \bar{x} is the mean of all observed values of x , and x_j is the value of observed neighbors.

Finding Local ¹⁶ indicator of Spatial Association (LISA) index is an important following step once we have calculated the Global Moran's I . The purpose of LISA analysis is to create clustered area based on identification of hotspots, and also to find local spatial relationship patterns. The purpose of the LISA's clustered area is to test each area and its influence on its global aspects. This index is a breakdown of Global Moran' I as described below [7]:

$$I_i = \frac{(x_i - \bar{x}) w_{ij} \sum_{j=1}^n (x_j - \bar{x})}{S^2} \quad (2)$$

where I_i is Local Moran's I for the i^{th} area, and S is standard deviation of measured variable in the study area.

There are several assumptions and methods combined in LISA analysis; however, this study only employs Moran's Scatterplot and significance maps.

⁷ 3 Methodology

3.1 Data Collection

Primary data ⁹ was obtained from questionnaire taken from April to May 2018. According to the data from Regional General Election Commission (*Komisi Pemilihan Umum Daerah – KPUD*) of the City of Tanjungpinang, the number of female voters in the 2014 Tanjungpinang's general election was 72,162. Thus, with such number of population, the minimum population sample required was 382 [8]. Because Tanjungpinang City consists of eighteen urban villages (*kelurahan*), so the minimum respondents per – *kelurahan* are 21 people.

Before the questionnaire is distributed, it is necessary to test the reliability and validity of the questionnaire. Reliability and validity tests are carried out by determining the value of ¹⁴

Cronbach's Alpha (α) of the measured items. This was done by conducting a pilot test on 10 – 20 April 2018 involving 30 respondents.

The Cronbach's Alpha of female voters' behavior questionnaire showed the number of 0.878. This α value confirmed that the items compiled were in a good level of validity [9]. Details about the items employed can be found in Table 1.

Table 1. Female Voters' Election Behavior Questionnaire Items

Behavior	Description
B1	I will vote a candidate based on ideology similarity regardless his/her gender
B2	Women have more weaknesses and limitations to be leaders compared to men
B3	Handsome men have their own attraction to be chosen
B4	I will vote the one I know best regardless his/her gender
B5	I will vote the one from having same tribe with me regardless his/her gender
B6	I will vote the one from my idol political party regardless his/her gender
B7	I follow the doctrine of my religion that men are more worthy of being leaders than women
B8	I will vote the most religious candidate
B9	I will vote a candidate based on my husband's advice
B10	I will vote a candidate based on religious leaders' advice
B11	I will vote a candidate based on my admired public figures' advice
B12	I will vote a candidate based on my work mates' advice
B13	I will vote a candidate based on my neighbors' advice
B14	I will vote a candidate based on my campus' advice
B15	There is no guarantee that if I choose a female candidate, she will fight for my civilian rights
B16	I will vote the one having family relationship with me
B17	I am not interested to female candidates because it has proven that they fail when leading

3.2 Spatial analysis methods

Spatial analysis is carried out through several stages as stated below:

1. Display spatial visualization of the dominant behaviors in Tanjungpinang's *kelurahan* by using QGIS software [10]
2. Select the 3rd most dominant behavior item to be analyzed.
3. Calculate Global Moran's I to see whether there is a spatial association in the designed area.
4. Conduct LISA analysis to find out if there is an area clustering and find patterns of local area based spatial relationships. This is performed by making a Moran's scatter plot, calculating local Moran's index, and drawing significant maps. Steps 3 – 4 are carried out by using Geoda software [11].

4 Results and Discussion

Figure 1 describes dominant (*kelurahan* based) – female voters' behavior in Tanjungpinang's 2014 election. Indexes A – R in Figure 1 represent *Kelurahan* Air Raja, Batu IX, Bukit Cermin, Dompok, Kampung Bugis, Kampung Bulang, Kemboja, Melayu Kota Piring, Penyengat, Pinang Kencana, Sei Jang, Senggarang, Tanjung Ayun Sakti, Tanjung Unggat, Tanjungpinang Barat, Tanjungpinang Kota, Tanjungpinang Timur, respectively. Detail about each *kelurahan*'s behavior value can be found in [12].

Figure 1 shows that behavior number 1 (B1) symbolized in red color and number 8 (B8) symbolized in green color contests to dominate the area of *kelurahan* in Tanjungpinang. From Figure 1, it can be seen that B1 is dominant in nine *kelurahans* whereas B8 in six *kelurahans*. Three *kelurahans* (Penyengat, Sei Jang, and Senggarang) are competing between them (violet color). Thus, the spatial analysis in this paper will be focused on B1 and B8.

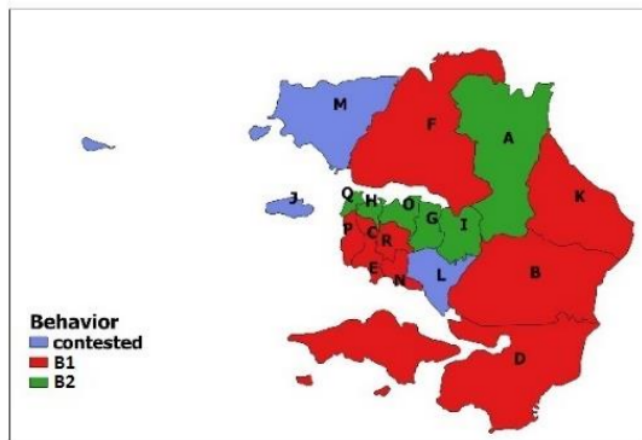


Figure 1. Spatial Pattern of Female Voters' Election Behavior in Tanjungpinang's *Kelurahan*

The calculation of Global Moran's I of B1 and B8 are presented in Table 2. Moran's I values vary from -1 to 1. The more Moran's I value tends to 0, the weaker spatial association happens. Positive Moran's I value indicates positive correlation which means the proximity area is identical. On the other hand, the negative Moran's I value indicates a negative spatial association, which imply adjacent area is not similar and forms a visual pattern like a chessboard. Table 2 shows that B1 indicates a positive spatial associations and B8 has a negative correlation. However, from the statistical test of P value shows that only B8 has a P value smaller than 0.05. This reveals that spatial association of B8 is statistically significant at 95% of confidence level. This finding confirms that B8 has a spatial association while B1 does not.

Table 2. Global Moran's *I* of B1 and B8

Factor	Moran' <i>I</i>	<i>P</i> value
F1	0.1533	0.1160
F8	-0.3177	0.0360

Figures 2 and 3 show the LISA analysis of B1 and B8, respectively. It could be seen from Figure 2 that six *kelurahan* located in high-high quadrant (I (HH)), 4 in high low quadrant (II (HL)), 4 in low-low quadrant (III (LL)), and 4 in low-high quadrant (IV (LH)). However, there are no significant spatial association of *kelurahan* for all quadrants of B1. On the other hand, Figure 3 shows that there are significant associations of B8 in HL quadrant which centered in Dompok and in LL quadrant which is pointed in Kampung Baru.



Figure 2. Moran's Scatter Plot (left) and LISA Cluster Map (Right) for B1 Behavior



Figure 3. Moran's Scatter Plot (left) and LISA Cluster Map (Right) for B8 Behavior

5 Conclusion

From this study we conclude that the most important factors for female voter's election behavior in Tanjungpinang are the similarity of ideology (B1) and candidate religiosity (B8). The spatial analysis of Global Moran's I and LISA indexes of both factors showed that there are no spatial association for B1 behavior while B8 has.

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