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Spatial Relationship Between Low Income Population and Regional Development Index in Mesuji District

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Abstract

This research aims to examine autocorrelation spatial analysis to see patterns of relationships or connections between locations (observations). In the study of the proportion of poverty in Mesuji District, it will provide important information in analyzing the poverty relationship between regions. Therefore, this research provides a spatial autocorrelation analysis in 2017. The methods used were the Moran's I test and the Local Indicator of Spatial Autocorrelation (LISA). The discussion shows a spatial relationship between the proportions of poor people between seven sub-districts in Mesuji Regency in 2017. In addition, the spatial distribution patterns will be clustered. Panca Jaya District has classified in one grouping of poverty called a low-low group. On the other hand, the high-low and low outlier categories were not found in the inter-district research area in Mesuji Regency. Finally, the regional development index variable has a negative and significant effect on the current population spacing without spatial concepts and concepts.

Keywords: spatial autocorrelation; poverty proportion; educational facilities
JEL Classification: R11

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1. Introduction

The problem of poverty is a complex problem and is multidimensional because it is closely related to various aspects of life, be it social, economic, cultural, and other aspects. Poverty is detailed in deprivation as a key in well-being. It is a bold issue anywhere in the world. It talks about income levels. It revealed the issue about food security. It mainly concerned about the quality of life. It defined about the asset bases. It mostly focused in human resource supply and demand (Zewdie, 2015). Therefore, the problem of poverty is one of the fundamental problems and has become the focus of attention of the government in any country, including Indonesia. A new form of spatial analysis is getting more interesting to talk about because the majority of the information would be utilized for planning activities such as development standard as a control to have a geographical component (Hussain & Johar, 2011). The Indonesian people have great concern for the creation of a just and prosperous society as contained in the fourth paragraph of the 1945 Constitution. Until now, when the Indonesian has been independent for more than 77 years poverty is still difficult to overcome and is still one of the main agendas of national development. The government's vision is contained in one of the nine priority agendas (NAWACITA), namely "Building Indonesia from the periphery by strengthening regions and villages within the framework of a unitary state" (Irawadi, Juanda, & Munibah, 2020). The research talked poverty mentioned that the results show that poverty characteristic in Sidoarjo Regency is caused cultural in both rural and urban area. Implementation of existing poverty reduction programs are still not optimal and targeted (Sangadji, 2015). Moreover, poverty and spatial analysis relates to one another more frequent as for the example of a research stated that the spillover effect of economic activity from one area to another is due to the inter- sector linkages, which have implications for economic growth. This study examines and presents empirical evidence on the effects of economic growth (Rosyadi & Yulyanti, 2021).

Education works as a driving force transforming society to break the chain of poverty. Education helps reduce poverty through labor productivity and social benefit channels because education is one way to accelerate knowledge of the population. It is an important development goal for the entire nation. By far, education is a tool gaining broader insight, knowledge, and skills so that job opportunities are more open and the wages are also higher. Currently, development requires the contribution of an educated and skilled population in order to fully participate in development. Elevating education must also be balanced with an increase in a regional development facility which includes an educational facility. According to Iswara & Indrajaya (2014), regional original income, per capita income, and education level simultaneously have a significant effect on poverty levels. By then, education becomes one of the variables examined in this paper. The reality about a current situation showed that education in the western and central parts of Indonesia is already in the medium and high level, while the eastern part of Indonesia is still in the medium or even low category (Salsavira *et al*, 2021). It is a crucial issue to be discussed for.

The state of the facilities in each region varies in different aspects both in terms of the amount of development and durability. This study examines a state of educational facilities that are concluded with the regional development index in Mesuji Regency, Lampung, Indonesia. Mesuji Regency is one of the autonomous regions in Lampung Province which will only turn eleven years old in November 2019. There are still so many development tasks that must be carried out by the Regional Government and all levels of society in Mesuji Regency, one of which is poverty reduction.

Tabel 1. Percentage Of Poor Population In 7 Mesuji Districts In 2017

No	Sub-district	Percentage of Poor Population (Percent)
1	Rawa Jitu Utara	44.07
2	Way Serdang	28.41
3	Mesuji Timur	61.77
4	Simpang Pematang	30.16
5	Panca Jaya	37.62
6	Mesuji	45.96
7	Tanjung Raya	33.90

Source: Bappeda Mesuji Regency 2017-2018

People who have higher education will have various skills and expertise in their respective fields so that they can increase their productivity. By then, workers can increase the output of a company, workers' wages, people's purchasing power so that it will reduce poverty in a country or region. The main factor in improving educational facilities is the improvement of infrastructure and facilities that are needed by the people in the region to support all activities in various fields. The following is the number of facilities owned by each sub-district in Mesuji Regency:

The ownership of a complete facility owned by the seven Districts in Mesuji must include facilities of education, social-economics, and health facilities in each area. Furthermore, development is a systematic and continuous effort to create different legitimate alternatives for the achievement of the most humanistic aspirations. In another sense, regional development is the effort to achieve aspects of growth, equity, as well as durability where it has dimensions of location in space and related to the socio-economic components of the region.

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Table 2. Number of Education, Social and Health Facilities in 7 Mesuji Districts in 2017

No	Sub-distric	Education Facilities	Social Facilities	Health Facilities
1	Rawa Jitu Utara	30	150	47
2	Way Serdang	83	260	76
3	Mesuji Timur	45	199	63
4	Simpang Pematang	32	30	45
5	Panca Jaya	19	98	2
6	Mesuji	25	130	44
7	Tanjung Raya	43	203	76

Source: Bappeda Mesuji Regency 2017-2018

Therefore, in addition to a sectoral approach, a spatial and locality method will help to understand the poverty reduction in Mesuji District. Generally, the main solution for the poverty reduction is to implement the poverty reduction program based on the characteristics of the area. The issues raised in this study are; 1). Is there a spatial relationship between poverty in seven Districts in Mesuji Regency; 2). Overview of the evaluation of the best model for different models without spatial concepts or with spatial perspective for poverty analysis in 7 Districts in Mesuji District; 3). How is the influence of the regional development index variable on poverty in 7 Districts in Mesuji Regency?

2. Research Method

2.1 Research Location

The location of this research covers all administrative areas in Mesuji Regency, which consists of 7 districts, namely Way Serdang District, Simpang Pematang District, Panca Jaya District, Tanjung Raya District, Mesuji District, East Mesuji District and North Rawajitu District pada periode penelitian 2017-2019. Figure 1 shows the area observed.

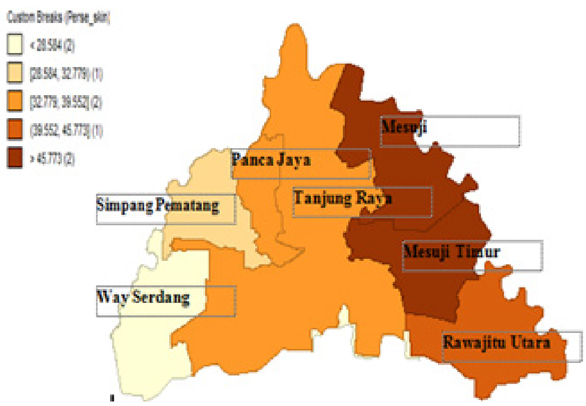

Figure 1. The areas used in the research

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Next, Table 3. It describes the variables used in the research.

Table 3. Variables Used

Variabel	Definisi Operasional	Sumber Data
Poverty of a rural (Y)	Poverty percentage of a rural	Mesuji government, BPS, PODES
The area of ricefield, garden, fish pond (LL)	The ratio of farming land in each rural	Mesuji government, BPS, PODES
Area Development Index Value (IPW)	Area Development Index Value (IPW)	The calculation using the method of Skalogram

2.2 Analysis of Spatial Patterns of Poverty in Mesuji District

Analysis of the spatial pattern of poverty in Mesuji Regency in this study uses three analysis techniques as has been done by Irawadi, Juanda, & Munibah (2020), namely the Global Moran Index and Anselin's Local Moran, Global Moran Index Analysis Measurement of Spatial Autocorrelation using the Global Moran Index:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\,(x_i - \bar{x})(x_j - \bar{x})}{S_0 \sum_{i=1}^{n}(x_i - \bar{x})}$$

Where is the average of observations and W_{ij} weights the relationship between region *i* and *j*. In testing the resulting Moran, *I* Index output, the following hypotheses can be used:

H_0 : No Spatial Autocorrelation
H_a : There is Spatial Autocorrelation
Note : in this study H0 is rejected when *-Z (I)* < -1,645.

If the *Z(I)* > value of $Z_{\alpha/2}$ or $-Z(I) < -Z_{\alpha/2}$, it can be concluded that there is a significant regional relationship at the α level of significance. The range of values of the Moran's Index in the case of a standardized spatial weighting matrix is $-1 \le I \le 1$. The value of $-1 \le I < 0$ indicates negative spatial autocorrelation, while the value of $0 < I \le 1$ indicates positive spatial autocorrelation, the Moran's Index value is zero indicates not in groups.

Spatial autocorrelation is the correlation between variables and themselves based on space or it can be said that the similarity of objects in a space, whether distance, time or region. The magnitude of spatial autocorrelation can be used to identify spatial relationships (Anselin, 1988). Often sub-districts that are close together have similar characteristics or indicators. So, there is a correlation in space or place, not a correlation between data from time to time.

2.3 Analysis of Anselin Local Moran

The formula and table explanation in the previous point is for calculating the Global Moran Index. One more tool is needed to detect local indicators of spatial association (LISA). The tool used is the Local Moran Index. There are two terms of LISA analysis, namely:

1) LISA for each observation indicates a significant spatial clustering around the observation area.
2) The total LISA for all observations is proportional to the indicator of global spatial relationships (Anselin, 1995).

The goal of LISA is to identify spatial groupings and outliers. The formula for the Local Moran Index is as follows:

$$I_i = \frac{(X_i - \bar{X})\sum_{j=1}^{N} w_{ij}\,(X_j - \bar{X})}{\sum_{i=1}^{N}(X_i - \bar{X})^2/n}$$

Where:

I_i : Moran's index for region *i*
W_{ij} : Spatial weighting element which refers to the location of the region *i* against neighboring area *j*
X : average

X_i : Value of area observation variable i

X_j : The value of the observation variable for region j, If the value of I_i is positive and significant, then the area grouping that occurs around region i is a grouping of areas that have the same characteristics as region j. On the other hand, the value of I_i is negative and significant, so the area grouping that occurs around region i is a grouping of areas that have different characteristics from region j.

2.4. Analysis of Spatial Patterns

2.4.1. General Model of Spatial Regression

Anselin (1998) developed a spatial regression model using cross-sectional spatial data. The general model of spatial regression or it can also be called the Spatial Autoregressive Moving Average (SARMA) can be presented as equations (2) and (3)

$y = \rho Wy + \beta X + u$ (1)
$u = \lambda Wu + \varepsilon$(2)

Where:
y: the vector of the dependent variable
ρ: spatial autocorrelation coefficient parameter in the dependent variable
X: independent variable matrix
β: coefficient vector of regression parameters
λ: error spatial autocorrelation coefficient parameter
ε: the error vector

2.4.2. Spatial Authoritative Model (SAR)

Anselin (1998) describes the Spatial Authoritative Model (SAR) in equation (3) If $\rho \neq 0$ and $\lambda \neq 0$, then the equation becomes:

$y = \rho Wy + \beta X + \varepsilon$(3)

Where y is the vector of the dependent variable, ρ is the spatial autocorrelation coefficient, W is the weighting matrix, β is coefficient vector of regression parameters
X : independent variable matrix
E : the error vector

The null hypothesis in the autoregressive spatial regression says that $\rho = 0$ (the parameter is not significant). It is rejected if $Z_{stat} > Z_{table}$ or *p-value* < α = 5 percent, that the regression coefficient is significant so it is worth using on model.

3. Results And Discussion

3.1 Results

3.1.1. Global Moran Index Analysis

Table 4. The results of the calculation of the Moran's Index

Year	*Moran's I*	*E(I)*	*z-value*
2017-2019	0.015873	-0.1429	1.9443

Note: ii positive and significant = positive autocorrelation with a clustering pattern that has the same characteristics.

Global Moran Index Analysis is used to analyze the spatial autocorrelation of poverty in Mesuji District. Based on the output tool Spatial Autocorrelation (Moran's Index) from Geoda software, it can be seen that the spatial pattern of poverty distribution is clustered.

Based on the data in Table 3, the calculated value of Moran's index in 2017-2019 shows a positive Ii value. This indicates that there is a level of spatial relationship in the form of positive autocorrelation, which means that there is a clustered pattern of regions with the same characteristics. To see whether there is a statistically significant spatial relationship, the Z test is carried out. If the Z value is greater than $Z_{a/2}$ or less than $-Z_{a/2}$, it can be concluded that there is a significant regional relationship at the significance level. In this study, the critical value of is 5% or $Z_{0.95}$ = 1.654. The results obtained from the table show that in 2017-2019 there is a statistically significant spatial relationship between poverty levels as evidenced by the value of $Z(I) > Z_{0.95}$, namely 1.9443 > 1.654, which means that there is a statistically significant spatial relationship between poverty levels.

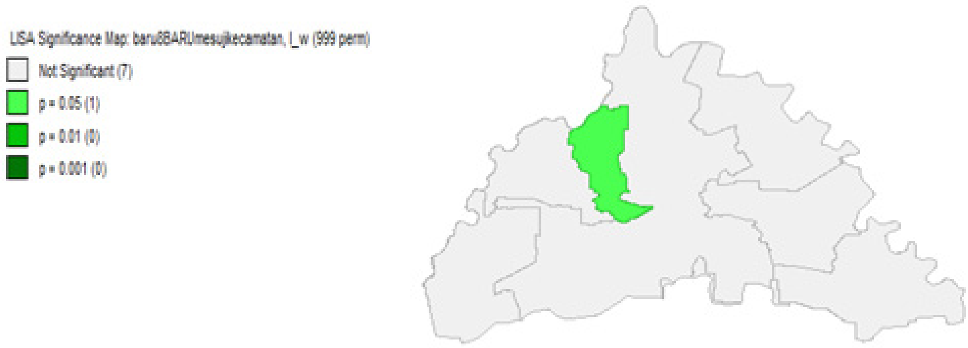

Figure 2. Moran Scatterplot of the percentage of poor population in 2017
Source: Geoda processed.

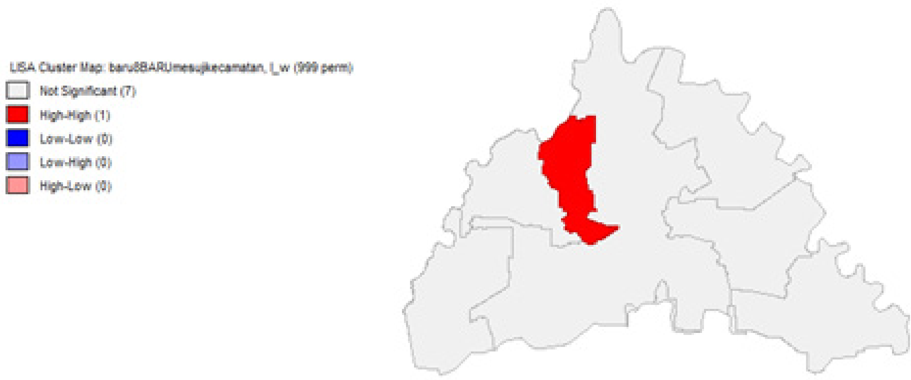

Figure 3. Map of LISA Poverty Signification Based on District
Source: Geoda Processed, 2020.

From the results of research on the spatial relationship of poverty levels between villages in Mesuji Regency in 2017-2019 it is known that the Moran's index value of the poverty level is 0.015873. The resulting Moran Index value is positive, namely 0.015873, so it can be concluded that there is a spatial autocorrelation of poverty between villages and spatially the distribution pattern is clustered.

The observed sub-districts received contributions or contributed to the economy with other villages. Villages that receive or contribute to the economy can be identified from the results of the LISA significant test. Panca Jaya is the only sub-district that receives a significant contribution from Simpang Pematang, Tanjung Jaya and Mesuji. These results can be seen from the LISA Significance Map in Fig. 2 The following is the result of the LISA Cluster Map in Figure 2

Mesuji Regency has 7 sub-districts which are neighbors with each other, the spatial concept of autocorrelation. The relationship between the contributions of neighboring regions is the relationship between the percentages of population poverty among regions. Next, it reveals that regions have different percentages of poor people. The difference in existing socio-economic conditions will certainly differentiate between neighboring areas. So, neighboring regions may have a spillover effect for adjacent areas. LISA Results for Panca Jaya's poverty level based on the LISA results were due to contributions from its neighboring areas, Simpang Pematang, Tanjung Raya, and Mesuji.

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3.1.2. Selection of the Best Model of Regression with Spatial Concepts

The best model can be seen through the value of Log Likelihood (LL), Akaike Info Criterion (AIC) and Coefficient of Determination (R^2). In statistics, Likelihood ratio test is a statistical test used to compare the correctness of two models. When the logarithm of the likelihood ratio is used, this statistic is known as the log-likelihood ratio statistic, and the probability distribution of this test statistic assumes that the greater the value of the Log Likelihood (LL) the better the model. The general form, Akaike Info Criterion (AIC) is:

$$AIC = -2\ln(L)+2K$$

Where:

K : the number of statistical in the estimation model

L : the maximum score of likelihood function for the model estimation.

The smaller value of Akaike Info Criterion (AIC) the better the model would be.

The AIC value at SEM is 56.666 with the Log Likelihood value of -25.332983 and R^2 0.892598. This value shows that the SEM

Spatial Model is better than other spatial models. The criteria used to select the model are the AIC value along with the log likelihood and R^2 The model is said to be good if it has a small AIC value and obtains a larger log likelihood value, and has a greater R^2 value. The SEM model was chosen to analyze cases of spatial relationship between the percentages of poor people in 7 districts in Mesuji Regency.

3.1.2.1. Lagrange Multiplier (LM)

Spatial model selection is done by using Lagrange Multiplier (LM) as initial identification. Lagrange Multiplier (LM) is used to detect spatial effects more specifically by using lag, error or both (lag and error). If the LM lag and LM error are not significant, it can be concluded that there is no spatial relationship between lag and error. Spatial linkage test was carried out on queen contiguity weighting. The results of the Lagrange Multiplier (LM) test are in the Table 5.

Based on the Tabel 5, the result from the test of *Lagrange Multiplier,* are follows:

1. for model of SARMA, accept H_0 because *p-value* (0.40174) > α = 0.10, so that there is a spatial dependence on the model, so it is necessary to form a spatial lag and error model.
2. for model of *SEM,* accept H_0 because *p-value* (0.16585) > α = 0.10, so that there is no spatial dependence on the model, so it is not necessary to form the spatial lag model.
3. for model of SAR, accept H_0 because *p-value* (0,00768) < α = 0.10, so that there is a spatial dependence on the model, so it is necessary to form a spatial error model.

Table 5. The Result of *Lagrange Multiplier* (LM)

LM	Nilai	Khi-Square	P-value	Keterangan
SARMA	1.8239	4.60517	0.40174	H_0 Accepted
SEM	1.9200	2.70554	0.16585	H_0 Accepted
SAR	0.6856	2.70554	0.00768	H_o Rejected

3.1.2.2 The Choosing of The Best Model

Table 6. The Best Model

Coefficient	SARMA	SAR	SEM
Intercept	0,469704	0,243006	0,776682
Area anHA	-0,000603102	-0,000557896	-0,000683
IPW	-2,16514	-2,17335	-1,96827

Coefficient	SARMA	SAR	SEM
R^2	0,905830	0,892598	0,870503
AIC	57,4315	56,666	57,3515
Log Likelihood	-24,7157	-25,332983	-25,6758
Λ		0,524612	

Based on Table 6, It can be seen from a model that it can be concluded that the model is a good model.

if the AIC value is the smallest and the Log Likelihood and R^2 values are the largest. Based on the table, information is obtained that SEM is the best model.

Based on the estimated calculation obtained R^2 of 0.870503 the model is able to interpret the percentage of the influence of all independent variables on the dependent variable of 87% and the remaining 13% of the independent variables are influenced by other variables not included in the research model. The SAR Spatial Modeling has a significant spatial lag coefficient (ρ) meaning that there is a dependency on the lag between regions. The value of obtained is 0.91912, which means that the magnitude of the spatial interaction between sub-districts in Mesuji Regency which has similar characteristics is 0.91912. following mathematical modeling Spatial lag model:

$$\widehat{y_i} = 0.91912 \sum_{i=1, i \neq j}^{n} w_{ij} y_i + -0.000683_{lanh_i} + -1.96827_{ipw_i} + \varepsilon_i$$

Table 7. Results of SAM

Coefficients	Notes
ρ	The value of 0.91912 can be interpreted that if all the independent variables are the area of agricultural land, the regional development index is considered constant or does not change, then the percentage of poor people is 0.91912 percent.
β_1	The value of -0.000683 can be interpreted that when the area of agricultural land increases by 1 percent, then the percentage of poor people decreases by 0.000683 percent assuming the percentage of poor people remains.
β_2	The value of -1.96827 can be interpreted that when the Regional Development Index increases by 1 percent, the percentage of poor people decreases by 1.96827 percent with the assumption that the percentage of poor people remains.

4. Conclusion

Spatial autocorrelation of poverty between sub-districts and spatially its distribution pattern is clustered. Moreover, the SEM model was chosen to analyze cases of spatial linkage of the percentage of poor people in seven sub-districts in Mesuji Regency. Finally, variable area of area of farming has a negative and significant effect on the percentage of poor people in Mesuji Regency in seven sub-districts in the statistical model, an increase in agricultural land will reduce the percentage of poor people

5. References

Anselin L. (1988). *Spatial Econometrics: Methods and Models*. Netherlands Kluwer Academic. Publ. ISBN-10: 9024737354.

Anselin, L. (1998). *Spatial Econometrics: Methods and Models*. Dordrecht.

Netherlands (NL): Kluwer Academic Publisher.

Anselin, L. (1995). Local Indicator of Spatial Association *LISA*. *Geographical Analysis,* 27(2): 93-115. http://onlinelibrary.wiley.com. Downloaded on June 30 2020.

Badan Perencanaan Pembangunan Daerah (2018). Regional Planning and Development Agency. Mesuji Regency, 2018.

Badan Pusat Statistik. (2018). Statistics of Lampung Province. Lampung province. Indonesia.

Central Bureau of Statistics. (2017). District / City Poverty Data and Information in 2016. *Central Bureau of Statistics*. https://www.bps.com.

Hussain, M., & Johar, F. (2011). The effective use of Geographic Information System (GIS) in the planning departments, Kuala Lumpur City Hall (KLCH). *Journal of Architecture, Planning and Construction Management*, 1(1) 65–80, http://journals.iium.edu.my/kaedjournal/index.php/KAEDJournals/article/download/7/13#page=109

Irawadi, A., Juanda, B., & Munibah, K. (2020). Analisis Kemiskinan Spasial dan Kaitannya dengan Sertifikasi dan Penggunaan Lahan Pertanian di Kabupaten Mamuju. *Jurnal Tataloka*, *22*(1). 70-82. 10.14710/tataloka.22.1.70-82.

Iswara, I. M. A. & Indrajaya, I. B. (2014). The Influence of Local Own Income, Per capita Income, and Education Level on Poverty Levels in Bali Province in 2006-2011. *E-Journal of EP Unud*, *3*(11), p: 492-501.

Mesuji District. (2017). Social Service Development of Poor Population by District in Mesuji Regency.

Rosyadi, M. I., & Yulyanti, S. (2021). Regional spillover effect on economic growth in pekanbaru city. *Journal of Economic, Business and Accounting, 4*(2), 621–634.

Salsavira, S., Afifah, J., Mahendra, F. T., & Dzakiyah, L. (2021). Spatial Analysis of Prevalence of Early Marriage and HDI in Indonesia. *Jurnal Matematika, Statistika dan Komputasi, 18*(1), 31–41. https://doi.org/10.20956/j.v18i1.13975

Sangadji, S. (2015). Karakteristik Kemiskinan dan Penanggulangannya di Kabupaten Sidoarjo. MIMBAR, *Jurnal Sosial dan Pembangunan, 31*(2), 495–506. cultural poverty, structural poverty, poverty reduction, monitoring and %0Aevaluation

Zewdie, M. A. (2015). Spatial Econometric Model of Poverty in Java Island. *American Journal of Theoretical and Applied Statistics, 4*(6), 411-420. https://doi.org/10.11648/j.ajtas.20150406.11.