

INVESTIGATING ECONOMIC GROWTH IMPACT ON POVERTY REDUCTION IN EAST JAVA: DOES SPATIAL MATTER?

Mega Puspitasari*, Vitri Nurmalasari* and Achmad Sjafii¹

*Student of Airlangga University; ¹ Lecturer at Airlangga University

ABSTRACT

Many studies on growth impact on poverty reduction have been conducted in Indonesia using various economic sectors and regional data. However, none of those studies have incorporated on even test the presence of spatial effects. This study is conducted using spatial analysis method to measure the impact of districts growth on poverty reduction in East Java. The estimation of growth elasticity of poverty is based on Ravallion's model (2001) by considering the presence of growth and poverty clusters identified by ESDA (Explanatory Spatial Data Analysis). The model is run to 37 districts of East Java on 2003 and 2007 by incorporating the presence of spatial effect. This is conducted by using spatial econometric procedure to test and model the presence of spatial effect. The spatial model is established by inserting spatial lag of district growth as independent variable. The estimation result finds that growth impact on poverty in East Java is geographically different. There are clusters of region which have high growth elasticity of poverty and there also clusters of regions with low and no impact of growth to poverty reduction. The significant impact of district growth spatial lag to poverty reduction in every cluster implies that poverty reduction program/policy needs to be coordinated among district governments in East Java. This is more important for districts that share borders.

Key words: growth, poverty, district, spatial analysis

1. INTRODUCTION

Indonesia as one of the largest countries in the world, followed international commitment to achieving better human development levels, which known as Millennium Development Goals (MDGs). The Declaration demanded that the world set its sights higher and aim for eight specific goals, most of which were to be achieved by 2015 and for which there are now 48, mostly numerical, indicators.

The first goal is to eradicate extreme poverty and hunger. It's means that each country should ensure that everyone has the basic resources they need, with sufficient income to meet their daily requirements and access to the quality and quantity of food that will enable them to lead normal, active and healthy lives (MDGs, 2003).

Economic theory believed that economic growth has a relation with poverty. While the economic growth is high, poverty will decrease because there's some additional income for each person. In MDGs report, Poverty rates in Indonesia increased markedly in the early years of the financial crisis as a result of widespread economic and social dislocation, though they subsequently fell again (from 60 to 27 percent). But, the fact shown that economic growth in Indonesia around 5%-6% per year, still can't reduce the number of poverty. Whereas it increase over time until 37 billions people. Data from World Bank says almost 50% of Indonesian is poor. So, there isn't significant result of economic growth impact on poverty reduction (Tarsidin, 2008). Looking this fact, economist think that there's a factor which "disturb" the relation. And the result is spatial aspect, because finally it's effect the relation between one to another region especially in economic activities and mobility of poor people.

Many studies analyzed the relation of economic growth and poverty, that looked as spatial matter. Such as analyze from SMERU tested the effectivity of poverty reduction in rural and urban area. Poverty in Indonesia is a phenomenon mainly found in rural areas, in particular in the agricultural sector. In urban areas poverty is mainly found in the informal sector (Sumarto, 2006). Or the other test about differentiation of poverty level in west and east Indonesia. There is a disparity in the process of economic development among regions in the country (Tadjoeddin et al., 2001; Esmara, 1975), with the Western part of Indonesia, comprising Sumatra, Java and Bali, developing faster than the Eastern part, or rest of Indonesia. It is suspected that the poverty level is higher in the East than in the West of Indonesia (Resosudarmo, 2004).

Scientific study about economic growth received that spatial aspect influence the elasticity of poverty reduction. Unfortunately, none of those research has incorporating spatial analysis (spatial statistic) in their studies. Spatial hypothesis of poverty reduction should be analyzed with spatial tools. Correct methodologies helped to get accurate result about this problem.

On East Java, speed of poverty reduction among district is different. Moreover, there's cluster between low and high elasticity of poverty reduction districts. It has been known by gap on some districts in East Java which called "boundary areas (daerah tapal kuda)". It's indicated that spatial aspect influence number of poverty reduction in a region. Beside that, it's also interesting to see the dynamical of poverty in East Java because the number of poverty here is 6,6 billions, with the total national poverty is 34,9 billions. So, there are almost 19,02% poor people stay in East Java.

On the other hand, national poverty rate at 2008 is 16,58%. But surprisingly the poverty rate in East Java around 19,98% at the same years. Here, we can conclude that poverty problem in East Java bigger than national. This fact become some of the reason why it's important to evaluating the economic growth effect on poverty reduction in East Java.

The main goals of this paper is to prove statistically whether or not the poverty reduction level in East Java significantly different on each district and specially determine by cluster of geography. It's also Measure the impact of district per capita growth on poverty reduction in East Java using spatial analysis method.

The paper is organized into six sections. The introduction in section one sets out the background. Section two investigates the literature review of the relationship between growth, poverty and spatial aspect which influence the poverty reduction. Section three presents the detail of the data source and spatial weights matrix. Methodology utilized at the section four. Section five presents results and discussion. And the final section discusses shortcomings and provides the conclusion.

2. LITERATURE REVIEW

The literature review conducted in this section aims to understand the links between growth, poverty and spatial aspect in East Java. First of all we should revisiting the linkage of growth, inequality and poverty reduction. There are at least two channels of linkages in the literature. Channel A, which is from inequality to economic growth and then poverty (growth effect) (Deininger and Squire, 1996 and 1998; Ravallion, 2001; Dollar and Kraay, 2000) and channel B, which is from economic growth to inequality and then poverty (inequality effect) (Kuznet, 1955; Lewis, 1954; Fields, 1980). Theoretical and empirical evidence suggest that the growth effect of Channel A is stronger than the distribution effect of Channel B (Resosudarmo, 2004). Bruno et al., (1996) found that rates of poverty reduction respond more elastically to the rates of change in the Gini Index than to mean consumption. They concluded that a modest fall in inequality has a positive effect on poverty. For any given rate of economic growth, the more inequality falls, the greater the reduction in poverty.

On his paper, (Daimon, 2001) said that there are no “poor areas” but only “poor people” who are geographically concentrated in specific locations. The problem is the existence of a vicious cycle of poverty that is locked in a certain location over generations. The incidence of poverty is not randomly placed over space but follows some systematic patterns. This phenomenon, often called a “spatial poverty trap” in the literature, describes structural relations between a geographic space and the incidence of poverty. Spatial poverty trap also can defines as a situation in which the persistence of poverty is due to the location of specific factors and where the cost of mobility is high.

The alternative explanation is that, with no mobility, spatial poverty traps occur because in some areas the “geographic capital”, that is “pure” geographic endowment like ecological conditions, or the supply of local public goods and infrastructure or the local endowment of private goods, is lower or less efficient than in others and because such capital has a positive impact on the marginal productivity of private inputs (De Vreyer, 2003).

The other important factor is migration, which can both, cause and be caused by poverty. Similarly, poverty can be alleviated as well as exacerbated by population movement. Easy generalizations are impossible to make but it is likely that the relative impact of migration on poverty, and of poverty on migration, varies by level of development of the area under consideration. In some parts of the world and under certain conditions, poverty may be a root cause of migration, whereas in other parts, under different conditions, the poor will be among the last to move. Equally, in some areas, migration may be an avenue out of poverty while in others it contributes to an extension of poverty (Skeldon, 2003).

Some research used spatial analysis to find the problem solving of their objective. (De Vreyer, 2003) use Generalized Method of Moments on two consecutive growth periods (GMM) to build the model of consumption growth and spatial poverty trap. This research find that spatial poverty traps are linked more strongly to socio-economic features of villages and provision of public goods rather than to purely geographic attributes. Spatial econometric method have been used also in the models of spatial dimension of welfare and poverty (Daimon, 2001).

The other paper which find the spatial problem has been done by Resosudarmo (2004) that concern to learn regional poverty in Indonesia. There is a significant difference between the mean of poverty in West and East Indonesia, using the three poverty measures for 1993-1996. One can conclude that, the gap between poverty in the East and the West worsens over time. SMERU (2006) also find the spatial problem in rural and urban sector in Indonesia. There is difference term of elasticity of poverty in each sector. All of that study shown that spatial problem consistent in the social-economic problem.

3. DATA AND SPATIAL WEIGHTS MATRIX

3.1 Data Set and Choice of Variabes

This study use data on percapita GRDP (Gross Regional Domestic Product) of each East Java’s regions in logarithms over the 2003 and 2007 period. The sample is composed of 38 regencies (*kabupaten*) and municipalities (*kota*) which extracted from “*Jawa Timur dalam Angka*” published by Central Bureau of Statistics (BPS). In east Java has 38 districts, but in this data we use 37 districts to comparable because Batu is become a new districts in 2004. Variables utilized in this paper are as follows. Growth is a increasing the Gross Domestic Product of a region from year to year. The compound annual growth in this analysis is:

$$Y = \text{Ln} (P_t/P_0)/T$$

Where:

P_t = percapita in year-t

T = time

P₀ = percapita in year 0

Y = growth

Poverty rate is the number of poverty divided by total population in that region. Based on Susenas 2007, poverty rate are classified in 3 category, that is close poor (category 1), poor (category 2), and very poor (category 3) which concern to poverty line. This paper are talking about category 2 and category 3. A person is poor when his consumption is less than a certain threshold, referred to as the poverty line. In defining this poverty line, BPS adopted the basic need approach; i.e. the 2,100 calorie per person per day requirement. In this paper we define poverty reduction as follow:

$$P = \ln (\text{Pov}_0/\text{Pov}_t)/T$$

Where:

- P = poverty reduction
- Pov_0 = poverty rate in year 2003
- Pov_t = poverty rate in year 2007

3.2 Spatial Weights Matrix

The spatial weight matrix is the fundamental tool used to model the spatial interdependence between regions. More precisely, each region is connected to a set of neighboring regions by means of a *purely spatial pattern* introduced *exogenously* in this spatial weight matrix W . The elements of w_{ii} on the diagonal are set to zero whereas the elements w_{ij} indicate the way the region i is spatially connected to the region j . These elements are *non-stochastic*, *non-negative* and *finite*. In order to normalize the outside influence upon each region, the weight matrix is standardized such that the elements of a row sum up to one. For the variable y_{it} , this transformation means that the expression Wy_{it} , called the spatial lag variable, is simply the weighted average of the neighboring observations.

This study use the traditional approach (a general spatial weight matrix) that is based on the geography of the observations, designating regions as ‘neighbours’ when they are share border of each other (a simple binary contiguity matrix).

4. METHODOLOGY

4.1 Exploratory Spatial Data Analysis

Exploratory Spatial Data Analysis (ESDA) is a set of techniques aimed at describing and visualizing spatial distributions, at identifying atypical localizations or spatial outliers, at detecting patterns of spatial association, clusters or hot spots, and at suggesting spatial regimes or other forms of spatial heterogeneity (Haining 1990; Bailey and Gatrell 1995; Anselin 1998a, 1998b). These methods provide measures of global and local spatial autocorrelation.

4.1.1 Global Spatial Autocorrelation

Spatial autocorrelation can be defined as the coincidence of value similarity with locational similarity (Anselin 2000). Therefore there is positive spatial autocorrelation when high or low values of a random variable tend to cluster in space and there is negative spatial autocorrelation when geographical areas tend to be surrounded by neighbors with very dissimilar values. The measurement of global spatial autocorrelation is based on the Moran’s I statistic, which is the most widely known measure of spatial clustering (Cliff and Ord 1973, 1981; Upton and Fingleton 1985; Haining 1990). For each year of the period 2003 and 2007, this statistic is written in the following way:

$$I_m = \frac{n}{S_0} \cdot \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{\mu}_x)(x_j - \bar{\mu}_x)}{\sum_{i=1}^n (x_i - \bar{\mu}_x)^2} \quad m = 2003 \text{ and } 2007$$

where x_i is the observation in region i and year m , μ_x is the mean of the observations across regions in year m . n is the number of regions. W_{ij} is the element of the spatial weight matrix W . This matrix contains the information about the relative spatial dependence between the n regions i . The elements W_{ii} on the diagonal are set to zero whereas the elements W_{ij} indicate the way region i is spatially connected to the region j . Finally, S_0 is a scaling factor equal to the sum of all the elements of W . Moran's I statistic gives a formal indication on the degree of linear association between the vector Z_t of observed values and the vector tWz of spatially weighted averages of neighboring values, called the spatially lagged vector.

4.1.2 Local Spatial Autocorrelation

Moran's I statistic is a global statistic: it does not enable us to appreciate the regional structure of spatial autocorrelation. However, one can wonder which regions contribute more to the global spatial autocorrelation, if there are local spatial clusters of high or low values, and finally to what point the global evaluation of spatial autocorrelation masks atypical localizations or "pockets of local nonstationarity", i.e. respectively regions or groups of contiguous regions, which deviate from the global pattern of positive spatial autocorrelation.

The analysis of local spatial autocorrelation is carried out with two tools: first, the Moran scatterplot (Anselin 1996), which is used to visualize local spatial instability, and second, local indicators of spatial association "LISA" (Anselin 1995), which are used to test the hypothesis of random distribution by comparing the values of each specific localization with the values in the neighboring localizations.

Anselin (1995) defines a local indicator of spatial association as any statistics satisfying two criteria. First, the LISA for each observation gives an indication of significant spatial clustering of similar values around that observation; second, the sum of the LISA for all observations is proportional to a global indicator of spatial association.

Anselin (1995) gives two interpretations for local Moran's statistics: they can be used, *first*, as indicators of local spatial clusters (or hot spots), which can be identified as locations or sets of neighboring locations for which the LISA are significant and *second*, as diagnostics for local instability, i.e. for significant outliers with respect to the measure of global spatial autocorrelation (atypical localizations or pockets of nonstationarity). The second interpretation of the LISA statistics is similar to the use of a Moran scatterplot to identify outliers and leverage points for Moran's I : since there is a link between the local indicators and the global statistic, LISA outliers will be associated to the regions which are the most influential on Moran's I .

4.1 Growth-Poverty Regression Model and Spatial Effect

There are three alternative specifications to capture the spatial dependence into β -convergence models (Rey and Montouri, 1999): *the spatial lag model*, *the spatial error model* and *the spatial cross-regressive model*. Most studies in this area use the spatial lag model & the spatial error model to deal with spatial dependence after previously conduct several diagnostic test (Lagrange Multiplier test) to decide whether a spatial lag or a spatial error model of spatial dependence is the most appropriate (Abreu, de Groot and Florax, 2004). *Spatial Cross-Regressive Model* of absolute β -convergence can be construct by adding the spatial lag of starting per capita incomes to the original specification:

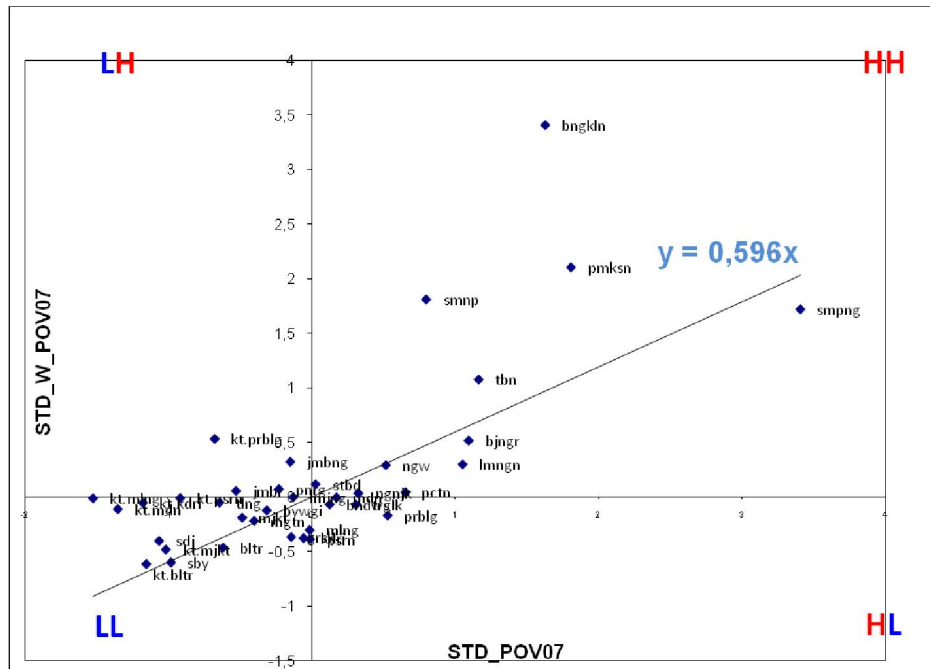
$$P = \alpha + \beta (1-G) Y + \gamma W (1-G) Y + e$$

5. Estimation Result

5.1 ESDA on Poverty Rate 2003 & 2007

5.1.1 Global spatial autocorrelation

Figure 1 displays the evolution of Moran's I statistic of log per capita GDP over the 2003 and 2007 period for the 37 districts in East Java. Inference is based on the permutation approach with 10000 permutations



The result of both measures suggests some kind of spatial heterogeneity in the East Java regional economies, the convergence process, if it exists, could be different across regimes. Here also the visualization of poverty distribution in East Java in 2003 and 2007. This map in order to give clearer picture about the difference of region which group into high poverty cluster (HH) – shown by red color – and low poverty cluster (LL). Although there’s a time lag between 2003 and 2007, but some region still known as high poverty cluster. For a while, we can conclude the poverty cluster move from south of East Java (in 2003) to north of East Java (in 2007).

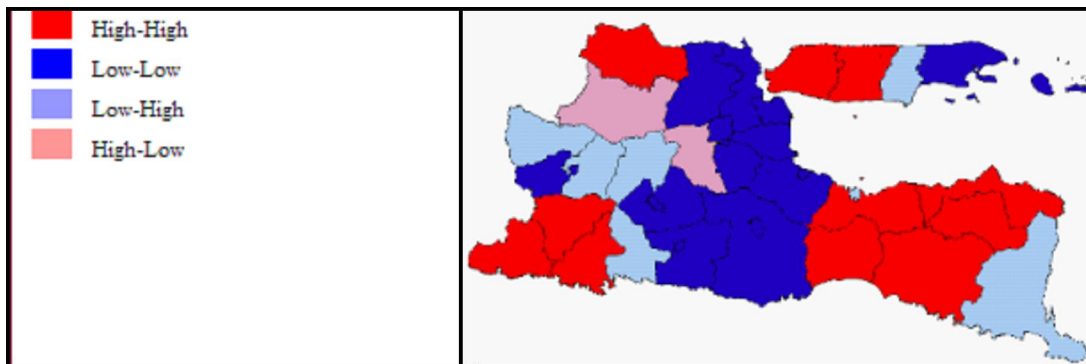


Figure 2. Poverty Cluster in 2003

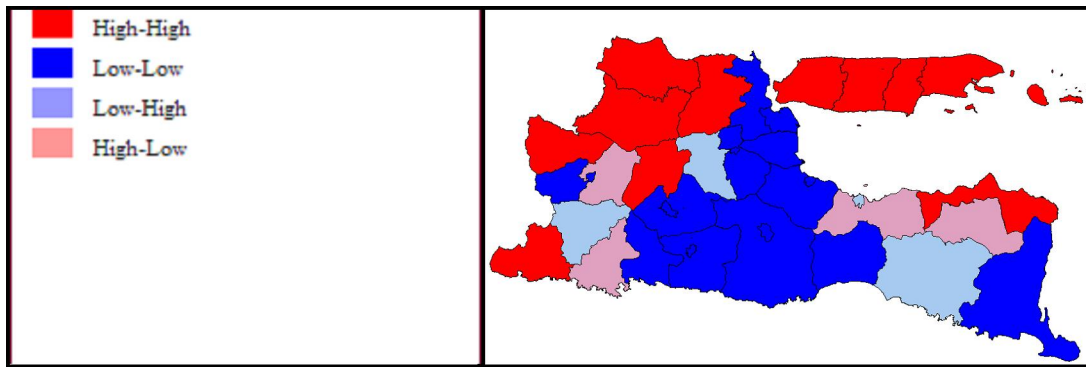
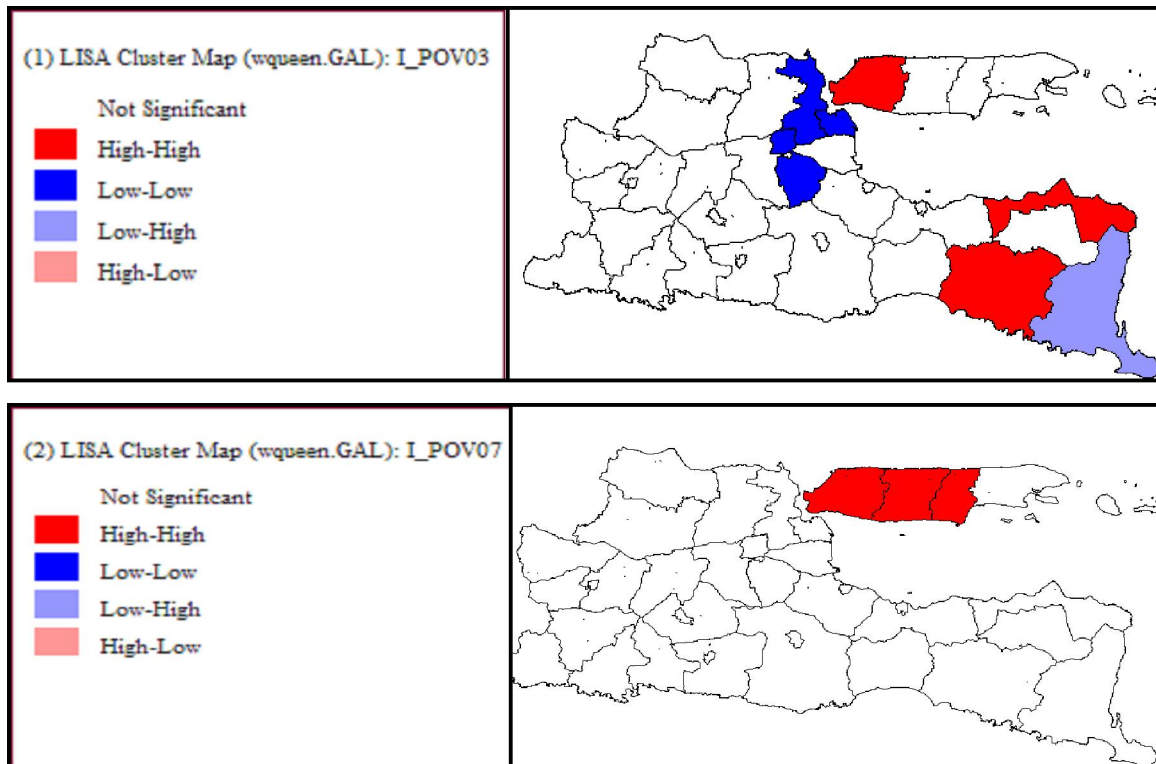


Figure 3. Poverty Cluster in 2007

Basically, it isn't enough for us to get the conclusion from global moran scatterplot. We better corrected using LISA, because only significant region will be shown in the LISA map. So, it will reduce insignificant region.

From LISA Cluster Map 2003, high poverty cluster's region can be find in Bangkalan, Situbondo, and Jember. There's also significant low poverty cluster in Surabaya, Mojokerto, and Gresik. Unfortunately, it's difficult to find significant low poverty cluster's region in 2007. Moreover, almost all Madura island significantly cover in low poverty cluster, there are Bangkalan, Sampang, and Pamekasan. Here is the map :

Figure 4. LISA Cluster Map in 2003 and 2007



Finally, here's the general map about distribution of GRDP Per capita growth (Y) and Poverty reduction (P) in 2003-2007 :

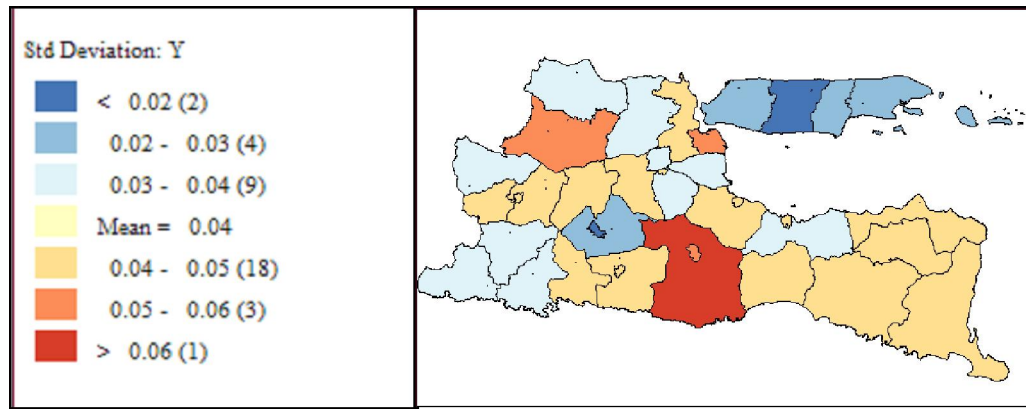


Figure 5. GRDP growth (Y) between 2003 and 2007

It can be informed that mean economic growth in East Java around 4%. The lighter color means the growth on those region is bellow average, and vice versa. Some region in north of East Java and all Madura island has lower growth than the other region. On the other hand, Malang become the highest economic growth in East java, which shown by red color.

From that condition, we can make distribution map of poverty reduction between 2003 and 2007 as follows :

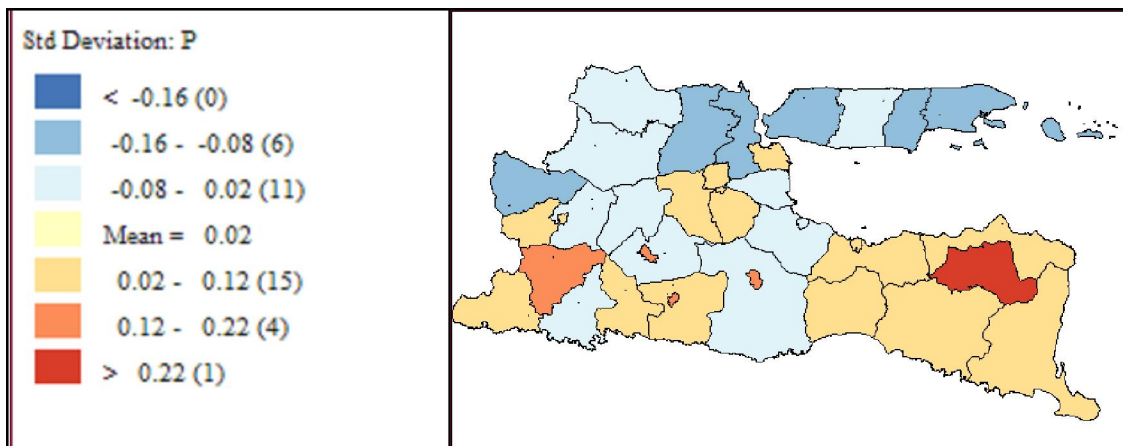


Figure 6. Poverty Reduction Map between 2003 and 2007

Overall, poverty reduction in East java around 2%. But there’s also some region which the poverty reduction result under average, vise versa there’s some region have the poverty reduction above average, shown by darker color. Surprisingly, Bondowoso become the highest poverty reduction’s region in East Java (shown with red color). Because in the 2003, this region has group on high poverty cluster region, and it can reduce the poverty’s number higher than the others.

The two map shows the consistence result. Some regions that have high economic growth also get high poverty reduction. Vice versa, the others region which low economic growth only reduce the number of poverty reduction under the average of East Java.

5.1 Regression Result

After evaluate the distribution of economic growth and poverty reduction, we do some regression to check significant level of each variable. There are some test variable which is related with poverty reduction. On of them, we use corrected growth Gini to look the ideal condition when there's no inequality on economic growth. How is economic growth effect to poverty reduction.

The writer use dummy of region in low poverty cluster because we already regress other variable and only dummy of region in low poverty cluster is significant. The result shows in almost of regression test that poverty reduction isn't significant with spatial lag of economic growth. It's also shown the same result when P variable (poverty reduction) is tested with spatial lag of corrected growth. Basically we test poverty reduction with spatial lag in order to know weather or not that poverty reduction in East Java has spatial dependence pattern.

Because of poverty reduction isn't significant with spatial lag, it's consistence with Ravallion's model. It means, poverty reduction pattern in East Java is spatial heterogeneity. So, there's no poverty reduction's pattern dependence between one region to another region. If there's a different pattern between region it means that poverty in each district is independence or it's affected by their self only, no influence from their neighbor.

Here also the record of regression result and some definition of the variable :

P	Poverty Reduction
Y	Percapita Growth
WY	Spatial Lag of Economic Growth
(1-G)Y	Corrected Growth with Gini
(1-G)WY	Spatial Lag of Corrected Growth
LPC03	Dummy of Region in Low Poverty Cluster 2003
LPC07	Dummy of Region in Low Poverty Cluster 2007

Result :

	P							
C	-0.06	-0.12	-0.05	-0.10	-0.19*	-0.16*	-0.19**	-0.16*
Y	2.10	0.94						
WY		2.38						
(1-G)Y			2.38	0.96	4.04	5.98*	2.68	5.34*
W(1-G)Y				2.95	2.98	0.18	3.57	
LPC03					0.17	-5.84		
LPC03*(1-G)Y					-4.5			
LPC03*W(1-G)Y					-1.1			
LPC07							0.30	0.24*
LPC07*(1-G)Y							-3.61	-6.50
LPC07*W(1-G)Y							-4.71	
R-squared	0.04	0.07	0.03	0.05	0.09	0.08	0.13	0.11
Adjusted R-squared	0.01	0.01	0.006	0.002	-0.04	0.001	0.009	0.03
AIC	-1.74	-1.71	-1.72	-1.70	-1.58	-1.67	-1.61	-1.7
SC	-1.65	-1.58	-1.64	-1.57	-1.32	-1.50	-1.35	-1.53
N	37	37	37	37	37	37	37	37

Constant and years dummies are included in all specifications

* means significant at $\alpha = 10\%$

** means significant at $\alpha = 5\%$

*** means significant at $\alpha = 1\%$

6. Conclusion

This paper utilizes 37 districts data set in East Java in 2003 and 2007. The paper has attempted to look the evidence of poverty reduction convergence in East Java using LISA (Local Indicators Spatial Autocorrelation).

Moran scatterplot detect the existence of spatial heterogeneity in the distribution of East Java regional percapita GDP 2003 and 2007. The Moran scatterplot is illustrative of the complex interrelations between global spatial autocorrelation and spatial heterogeneity in the form of spatial regimes. The result of both measures suggests some kind of spatial heterogeneity in the East Java regional economies, indicated the convergence process. From regression process, we also found that poverty reduction isn't significant with spatial lag, it's consistence with Ravallion's model. It means, poverty reduction pattern in East Java is spatial heterogeneity. So, there's no poverty reduction's pattern dependence between one region to another region.

And the paper result are (1): corrected growth is significant when its controlled with low poverty cluster, there is spatial heterogeneity in East Java regional poverty reduction, (2) There is no evidence spatial lag has an impact on poverty reduction, so no spatial dependence between region.

Unfortunately, policy implications from the above findings are relatively limited, but some are as follows. If Indonesia want to combat poverty problem, it must be seen at disaggregated level, because the pattern of poverty is difference accross region. And the poverty reduction strategy must be adjust with the differences.

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