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SPATIAL DIMENSION OF REGIONAL ECONOMIC GROWTH IN SUMATERA ISLAND

Amlys Syahputra Silalahi[1], Raja Masbar[2], Sirojuzilam, Aliasudin[2]

[1]Doctoral Student of Economic Faculty of Syiah Kuala University
[2]Lecturer of Economic Faculty of Syiah Kuala University

ABSTRACT: *This study aims to examine and analyze the influence of economic growth determinants and economic growth spillover on the economic growth of the regencies/the cities in Sumatra Island. This study uses a quantitative analysis model of Moran's I Global, Spatial Autoregressive Model (SAR) with weighted matrix of six and eight in the neighboring areas. The determinants of economic growth are explained by labor, human capital, catch-up technology, market potential, agricultural sector contribution, industrial sector and service sector. Based on the analysis of Moran's I, the spatial dependence of economic growth between regencies/cities is significant in Sumatra Island. Based on SAR model, it is concluded that the spillover of economic growth, labor, contribution of agriculture sector, service sector and market potential have positive and significant influence; the contribution of industrial sector has positive but insignificant influence; while human capital and catch-up technology have negative and significant influence on the economic growth of a regency/city in Sumatra Island.*

KEYWORDS: The Spillover Of Economic Growth, Labor, Contribution Of Agriculture Sector, Service Sector, Market Potential, Human Capital, Catch-Up Technology, Moran's I, Spatial Autoregressive Model (SAR)

INTRODUCTION

Spatial or neighboring aspects on regional economic analysis are important things that can not be ignored because inter-regional interaction happens in certain. It originated from Tobler (1970), who was known as Tobler's first law of geography, "Everything is related to everything else," but near things are more related than distant things" (Anselin, 1988). The mobility of production factor, trade relations and geographical overflow (such as technology deployment) can be a reference to how to understand the economic development of an area which is affected by its neighbors (Agha and Vedrine, 2010). Not paying attention to the spatial dimension causing the economic development of an area appears more determined by market mechanism. Capital and people tend to choose the areas that offer higher returns and interest. As a result, the developed areas are advancing forward and the lagging areas will remain behind (Kuncoro, 2012).

Spatial aspects are important in explaining economic growth. Countries can interact with each other through channels such as trade, technological diffusion, capital flows, political, economic and social policies. Spatial externalities can spillover across borders between countries, which contributes in explaining economic growth. The agreements between neighboring countries, such as ASEAN Economic Community (AEC), North America Free Trade Area (NAFTA), European Economic Union (EEU), have been designed to promote trade and as a result, growth will happen. Technology diffusion between neighboring countries is also very important.

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According to Ciccone (1996), the level of technology in each country is unlikely to rely solely on externalities which are derived from the accumulation of domestic capital, but are also influenced by the aggregate level of technology from neighboring countries.

A number of studies have been conducted to show the importance of spatial effect in the study of economic growth. The studies which were conducted by Sala i Martin (1995); Ciccone (1996); Ades and Chua (1997) and Rey and Montuori (1999) show there is spillover effect of neighboring countries on the economic growth in a country. The research on the analysis of regional economic growth is increasing by using spatial econometrics. In Europe for example, Vaya *et al* (1998); Fingleton (1999); López-Bazo *et al* (1999) and García de la Vega and Herce (2000) have studied the spatial influence by using the spatial econometrics. In China, the study of spillover effect using spatial econometrics has also been done by Ying (2000); Brun *et al*. (2002); Zhang and felmingham (2002) and Ying (2003).

The study of economic growth by taking into consideration the spatial aspect has not been done in Indonesia. Some of them have been done by Rumayya *et al.* (2005), they show the overflow effect of revenue growth in the regencies in East Java; Vidyattama (2012) uses Geographic Information System (GIS) analysis which shows the concentration and spatial relationship between *PDRB* (GRDP) per capita and Human Development Index (HDI/*IPM*); Sugiharti (2014) examines the regional income convergence in East Java which finds that spatial dependence actually occurs where the economic growth of an area is influenced by the economic performance of its neighboring areas; Vidyattama (2014) examines the economic growth of the provinces in Indonesia by using the Spatial Lag and Spatial Error technique in the regression of economic growth. The above studies illustrate the spatial growth and spatial dependence among important areas in influencing the economic growth of an area.

Based on the studies which are described above and to better understand interdependence and the influence of economic growth determinants that take into account the spatial aspect, researchers are motivated to undertake studies on Sumatra Island with regencies/cities as an analytical unit. The studies on economic growth in Sumatra Island that specifically consider the spatial aspects and the use of spatial econometric methods as a means of analysis have not been widely applied. Several studies which are related to the economic growth that take place in Sumatra Island are mostly done partially by taking the location of a certain provincial level. As an example of a study which is conducted by Robiani (2004), Adry (2012), Nur (2012), Hanum (2004), Sastri (2013), Mahdi *et al*. (2014) and Sinaga (2014) only consider the determinants of economic growth in a particular province and have not considered the spatial aspects of regional interdependence and the spillover of neighboring regional economic growth.

Why Sumatra Island? The average of Gross Regional Domestic Product (*PDRB*) per capita in Sumatera Island based on constant price (ADHK) in 2010 was 28.15 million rupiah with an average growth rate of 3.39 percent per year during 2005-2010. While in the period 2010-2015 the average of GDP/*PDRB* per capita regency/city in Sumatra Island at constant prices (ADHK) in 2010 is 31.63 million rupiahs with an average growth rate of 3.41 percent per year. Although there is an increase in GDP/*PDRB* per capita from 2005-2010 to 2010-2015, which is followed by an increase in the rate of economic growth during the same period but the distribution of growth rate is less evenly (see Figures 1 and 2).

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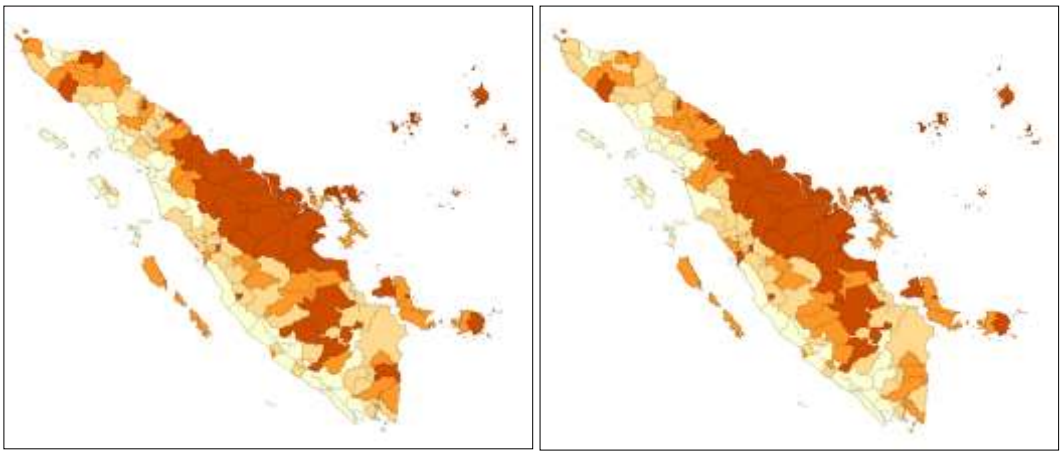
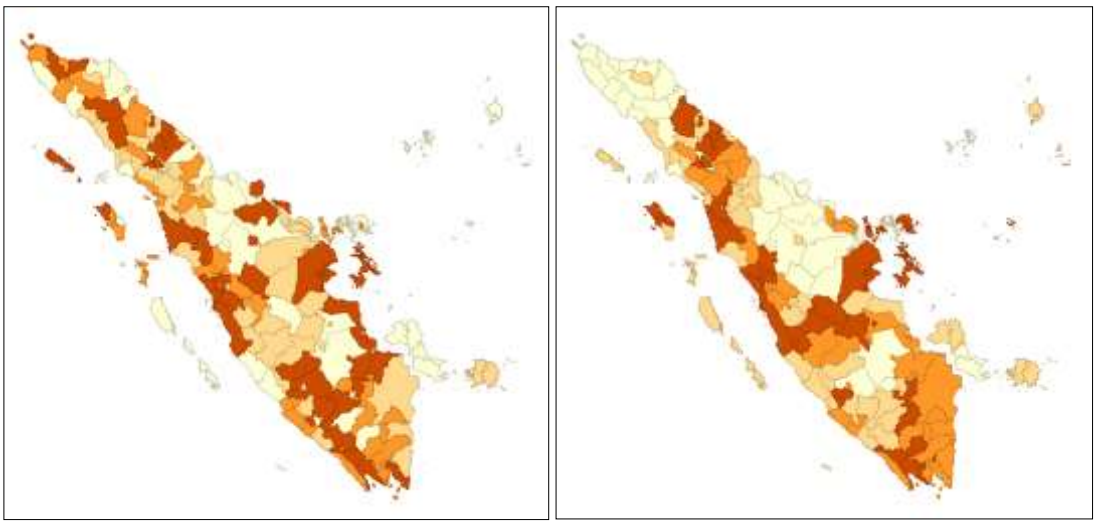
Figure 1 (a) shows the average distribution of GRDP/*PDRB* per capita of regencies/cities in Sumatra Island in 2005-2010 which is categorized as high and very high concentrated on the east coast of Sumatra, especially regencies/cities which are located in Riau Province, North Sumatera, Jambi, Riau Islands and parts of Aceh province. This is understandable considering that these areas contain natural resources, especially high oil. In Figure 1 (b) the average distribution pattern of GRDP/*PDRB* per capita in Sumatra Island in 2010-2015 has undergone significant changes from 2005-2010, especially in the provinces of Aceh, Riau and parts of South Sumatra.



Periode 2005-2010 Periode 2010-2015

Figure 1. Average Distribution of Gross Regional Domestic Product (PDRB) per capita of Regency / City in Sumatera Island.



Periode 2005-2010 Periode 2010-2015

Figure 2. Distribution Average Growth Rate of GDP per capita of Regency / City in Sumatera Island

Figure 2 (a) shows the average distribution of GDP/*PDRB* growth per capita of regencies/cities in Sumatra island in 2005-2010 which are in high and very high category is spread fairly evenly

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on the island, but in Figure 2 (b) average distribution pattern of GRDP/*PDRB* per capita regencies/cities in Sumatra Island in 2005-2010 which are in high and very high category experienced significant changes. Mainly there is a decrease in the growth rate in some regencies/cities in the provinces of Aceh, Riau, South Sumatra and Riau Islands. Meanwhile, the increase of growth rate actually happened in some regencies/cities in North Sumatera, Jambi and part of Lampung.

Figures 1 and 2 show that regencies/cities absolutely have high GDP/*PDRB* per capita is not always followed by high growth of GRDP/*PDRB* per capita as well. Fluctuations in the growth rate of GRDP/*PDRB* per capita in Sumatra show a problem and of course this is influenced by various factors or determinants.

This study uses a model framework of Benhabib Spiegel (1994) where the determinants of economic growth include physical capital stock, labor, human capital, technological diffusion or Catch-up technology. Vidyattama (2014) adds to the role determinants of agriculture, industry and services. Furthermore, Bai (2012) adds the influence of market potential to the growth of regional income. The spatial dimension in this study is to consider the spillover effect of the economic growth in neighboring regencies/cities on the economic growth of a particular regency/city. The determinants of economic growth which are considered in this study include human capital, labor, catch-up technology, market potential, the role of agriculture, industry and services. The main problem to be discussed in this study is how the influence of economic growth determinant to economic growth of a regency/city and spillover effect of economic growth of a regency/city to economic growth of other regencies/cities in Sumatera Island.

LITERATURE REVIEW

Ramírez and Loboguerrero (2002) examine economic growth by taking into account spatial dependence among countries. This study uses spatial econometrics to estimate the growth model by incorporating the aspects of cross-country interdependence, in which the economic growth of a country depends on the growth rate of its neighbor. These results suggest that spillover effects between countries are very important for growth. This study shows that spatial interrelation can not be ignored in analyzing economic growth. Ignoring the relationship produces the wrong model specification.

Bai, C.E, Hong MA and Wenqing PAN (2012), investigate the spatial structure of provincial economic growth and spatial spillovers in China from 1998 to 2008. They apply the Moran index to detect positive spatial autocorrelation across provinces in China. Bruna, F. *et.al.* (2014) analyzes cross-sectional in GVA elasticity changes per capita of Market Potential (MP) during the period 1985-1995 in Europe in four subsamples which are characterized by the Poor-Rich and Central-Peripheral regions. This study uses the NEG wage equation framework and uses the Market Potential measures which are introduced by Harris (1954). Variables which are used are gross value added per capita (GVA), human capital which is proxied with residents that complete education in science and technology up to level three and work in science and technology, real market potentials which are proxied by Harris's market potential, distance average, area and per capita capital stock. The analysis model which is used is OLS and OLS data panel, SEM, SAR and Moran's I. The study results show the negative slope of influence of MP on GVA per capita is strong enough. Location variable, external MP shows decreasing

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trend. The available evidence is not totally convincing as it is very sensitive to the inclusion of control variables. The cross-sectional effects of external MP disappear when they are inputted by the control of physical capital and human capital as well as spatial autocorrelation. In other specifications, strong evidence is found to be associated with a declining role of location in explaining GVA per capita in the Peripheral region. This is consistent with the slow Peripheral region in escaping the curse of distance.

Martínez-Galarrag J., *et.al*, 2014 undertakes a study of market potential influence on regional economic growth in Spain with the observation period 1860-1930. Analytical techniques which are used are both parametric and non parametric. In their research, the market potential is measured using the Harris concept (1954) by adding overseas market potential in addition to domestic market potential. The results conclude that there is a positive and significant influence of market potential on Spanish regional economic growth, especially during the period 1860-1930.

SUN, Caizhi, Yudi YANG and Liangshi ZHAO (2015) use panel data on the Bohai Rim region in China to test spatial autocorrelation using global Moran's I index and local Moran's I index, and measure the spillovers effects of economic spatial with Durbin's spatial econometric model. The objectives of the study are to find out whether the economic development of coastal rgencies is beneficial to all regions. To do this, they focus on the "distance from the beach" factor, which is affected by transport time. The results indicate a significant spatial autocorrelation in the Bohai Rim Region. Furthermore, there is an spillover effect of economic spatial in this region. "Distance from the beach" has a significant negative impact on GDP/*PDB* per capita but has a significant positive impact on GDP/*PDB* per capita of other regencies. This means that the economic development of coastal regencies does not benefit the whole region. The "export value" has a significant positive influence on the local economy and no significant influence on other regions, while "direct foreign investment" has a significant positive influence on the local economy and has a significant negative influence on other regions. "Number of employees" has a significant positive influence on the local economy and significant negative influence on other areas. Factors of "primary industry share in GDP" and "industrialized tertiary share in GDP" influence the local economy positively, but the industry tertiary share in GDP negatively influences other countries. "The level of fixed investment assets" influences the local economy negatively and has no significant influence on other regions. "Total retail sales of social consumption goods" has no significant influence on the local economy but has significant positive influence on other areas. Finally, the utilization of marine resources and marine output can influence positive economic growth.

RESEARCH DATA AND METHODS.

This study is an exploratory research that examines the influence of regional economic growth determinant by considering spatial aspect. The study is conducted in all regencies/cities in Sumatera Island during 2010 - 2015. The Sumatra Island Region which is referred to in this study consists of 154 regencies/cities that are spread over ten provinces namely Aceh Province, North Sumatera Province, West Sumatera Province, Riau Province, Jambi Province, South Sumatera Province, Lampung Province, Bengkulu Province, Bangka Belitung Islands Province and Riau Islands Province.

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The data which is used in this study is secondary data from each regency/city in Sumatra that is obtained from the official publication of the Central Bureau of Statistics such as: Statistics Indonesia, Provincial Statistics in Sumatera Dalam Angka; Bank Indonesia and other agencies or institutions. The data includes the following variables:

g_{yi} = growth of GDP per capita
h_i = human capital
l_i = labor
hCT_i = *catch-up technology*
MP_i = Market Potential
$Pert_i$ = contribution of agriculture sector
Ind_i = contribution of industrial sector
$Jasa_i$ = contribution of services sector

Analysis Model

The analysis model to be used is Spatial Error Model (SEM) which is an error spatial model where in error there is spatial correlation, this model is developed by Anselin (1988). In the SEM model, it is assumed that the autoregressive process is only in error. The general model of SEM is shown by the equation:

$$\boldsymbol{y = X\beta + u} \quad \textbf{(1)}$$

$$\boldsymbol{u = \lambda W u + \varepsilon} \quad \textbf{atau} \quad \boldsymbol{u = (1 - \lambda W)^{-1}\varepsilon}$$

$$\boldsymbol{\varepsilon \sim N(0, \sigma^2 I)}$$

If y = g_{yi} and matrix **X**=[h, l, hCT, MP, Pert, Ind, Jasa], then operationally equation (1) can be rewritten as follows:

$$\boldsymbol{g_{yi} = c + \beta_l l_i + \beta_h h_i + \beta_c hCT_i + \beta_{mp} MP_i + \beta_p Pert_i + \beta_{in} Ind_i + \beta_{js} Jasa_i + \mu_i + (1 - \lambda W)^{-1}\varepsilon_i} \quad \textbf{(2)}$$

Determination of Spatial Estimation Model

Before estimating the spatial econometric model, there are some initial steps to analyze the best model that can be used in spatial econometric analysis. The first analysis that is conducted in this study is Moran's I Statistic test, this test is done to see the existence of spatial dependence in the model so that from the analysis can be seen that the need for further spatial analysis in the model. The null hypothesis of the Moran's I test is that there is no spatial autocorrelation in the model.

Moran's I Statistic Test uses the following formula (Anselin, 1995, 1996):

$$\boldsymbol{I = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad \textbf{(3)}$$

Where y_i observes y in location i, y_j observes y in location j, $\bar{y}$ value is y average in whole

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observation, *n* is total number of geography unit or location, W_{ij} is spatial weighted matrix. Spatial weighting matrix is the basic tool that is used to model inter-regional spatial dependencies. Masing-masing daerah terhubung ke satu set daerah tetangga melalui pola spasial dengan kondisi eksogen dalam matriks pembobot spasial W. Each region is connected to a set of neighboring regions via a spatial pattern with exogenous conditions in W spatial weighted matrix. The spatial weighted matrix is an *n x n* size matrix with a zero diagonal value in which the matrix form can be expressed as follows:

$$\boldsymbol{W_1\ atau\ W_2} = \begin{bmatrix} \boldsymbol{w_{11}} & \boldsymbol{w_{12}} & \cdots & \boldsymbol{w_{1n}} \\ \boldsymbol{w_{21}} & \boldsymbol{w_{22}} & \cdots & \boldsymbol{w_{2n}} \\ \vdots & \vdots & \boldsymbol{w_{ij}} & \vdots \\ \boldsymbol{w_{n1}} & \boldsymbol{w_{n2}} & \cdots & \boldsymbol{w_{nn}} \end{bmatrix} \quad (4)$$

In this research, SEM model is estimated by using instrumental variables or generalized method of moments (IV/GMM) method. The use of Generalized Method Of Moments (GMM) techniques, or more specifically Spatial Autoregressive Generalized Moments (SAR-GM) can be performed even if the distributed (residual) error is not normal (Sandberg 2002)

RESULT AND DISCUSSION

Determination of Spatial Weighted Matrix

Determination of spatial weighted matrix is very important before conducting spatial interdependence analysis between regions as well as spillover analysis of inter-regional economic growth by using SEM model. The distance spatial weighted matrix (weight distance) will be used in this study (Vidyattama, 2014; Sandberg, 2002 and Yanti, Junaidi, Yulmardi, 2014). The distance spatial weighted matrix that is used is Wd310, meaning that the areas are within a distance radius of 310 km from the center of an area. The setting distance of 310 km by considering the threshold distance = 308.264952 km means that if the weight matrix distance is less than the threshold limit then there will be areas that have no neighbors.

Morans'I Global Index

The global spatial dependence test for economic growth across regencies/cities in Sumatra Island is conducted by using the Morans'I Global Index (see Table 1).

Table 1. Morans'I Global Index of Regency/City Economic Growth in Sumatra Island, 2011-2015.

Weight Matric	Moran I statistic	E(I)	Mean	sd	z-value	p-value
Wd	0.0411	-0.0064	-0.0063	0.0186	2.5538	0.0180

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From Table 1, it is obtained Moran's I index value of 0,0411 with p-value = 0.0180 which is smaller than α = 0.05. It means that there is significant global spatial dependence of economic growth average among regencies/cities in Sumatra Island on the basis of distance weighted matrix. In other words, there are clusters (groups) of regencies/cities with an average rate of economic growth during the same period 2010-2015 based on distance.

Determination of Spatial Model which is Used

SEM model estimators are very sensitive to changes in weighted matrix that is used. The process of spatial model determining which will be used in this study begins by running multiple linear regressions (OLS) by taking into account the distance spatial weighted matrix (WD).

Table 2 Regression Result with OLS method.

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	-1.1202260	0.9548977	-1.1731372	0.2426003
H	-0.1547704	0.0528070	-2.9308695	0.0039095
H_CT	-0.0007205	0.0003348	-2.1522345	0.0329786
Ind	0.0130973	0.0164963	0.7939537	0.4284766
Jasa	0.1566330	0.0454140	3.4490040	0.0007306
L	0.2865416	0.0845222	3.3901345	0.0008929
MP	0.1230597	0.0493182	2.4952162	0.0136711
Pert	0.0273791	0.0100993	2.7110007	0.0074907

Data set : Sumatera_Kabkota.dbf

R-squared	0.2587	TEST ON NORMALITY OF ERRORS	
F-statistic	7.4791	Jarque-Bera	178.642 [0.00001]
Prob(F-statistic)	1.03E-07	DIAGNOSTICS FOR HETEROSKEDASTICITY	
Log likelihood	-317.454	Breusch-Pagan Test	52.879 [0.00001]
Akaike info criterion	650.907	Koenker-Bassett test	17.171 [0.01631]

Indikator	Weights matrix (Wk8)	Prob.
Moran's I (error)	8.6540	0.0000
Lagrange Multiplier (error)	56.711	0.0000
Robust LM (error)	4.4700	0.0345
Anselin-Kelejian Test (2SLS)	0.0010	0.9821

From the estimation results with OLS in Table 4.2, it is known that the model still faces an abnormal residual distribution problem where the value of Jarque-Bera is 1778.642 with p-value 0.0000 <α (0.05). In addition from the results of homoscedasticity assumption test indicate there is a problem of heteroscedasticity by using Breusch-Pagan test, it is obtained results of 52.879 with p-value 0.0000 <α (0.05). The presence of residual normality and heteroscedasticity problems indicate the need to include spatial elements in the analysis.

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From the test results of spatial dependence, based on distance spatial weighted matrix which is used, it is obtained the value of Moran's I (*error*) with p-value which overall is smaller than α (0.05). This means there is significant spatial dependence. It is therefore recommended to include spatial elements into the analysis model.

From result of OLS regression above, it is obtained that Robust LM value (*error*) has p-value that is smaller than α (0.05). Thus the use of the SEM model can be justified for the distance spatial weighted matrix. However, in this study, spatial analysis of regional economic growth in Sumatra Island will use the method of Generalized Method of Moments (GMM) estimation, where the SEM model will be applied with distance spatial weighted matrix. The use of Generalized Method of Moments (GMM) technique can be performed even if the error (residual) which is distributed is not normal (Sandberg, 2002).

Results of Spatial Regression

Based on the estimation result in Table 3, it can be explained the relationship and significance of each independent variable influence to the dependent variable of economic growth of regency/city in Sumatera Island as follows:

Table 3 Estimation Results of SEM Model Using W weighted matrix

Variable	Coefficient	Std.Error	z-Statistic	Probability
CONSTANT	-1.7839115	1.0165911	-1.7547975	0.0792940
H	-0.1025897	0.0525129	-1.9536101	0.0507473
H_CT	-0.0005607	0.0003238	-1.7315700	0.0833502
Ind	0.0095385	0.0157118	0.6070919	0.5437899
Jasa	0.1519757	0.0437830	3.4711154	0.0005183
L	0.2220967	0.0823438	2.6971893	0.0069927
MP	0.1400169	0.0542348	2.5816814	0.0098320
Pert	0.0337263	0.0099088	3.4036753	0.0006649
lambda	0.3643191	0.0907306	4.0153928	0.0000593

The Influence of Labor

Table 3 shows that labor has a positive and significant influence on the economic growth of regencies/cities in Sumatra Island at the level of testing α = 0.01. Thus the increasing share of total labor force to the population will increase the rate of economic growth of regencies/cities in Sumatra Island. This finding is in accordance with the results of research from Latip (2009), Fatmawati, Irma *et al*. (2009), Benos, N., *et.al* (2010), Bai, CE, Hong MA and Wenqing PAN (2012), Maharani, K. and Isnowati, S. (2014) and research results of SUN, Caizhi, Yudi YANG and Liangshi ZHAO (2015).

The Influence of Human Capital

Table 3 shows that human capital has a negative and significant influence on the economic growth of regencies/cities in Sumatra Island at the level of testing α = 0.10 for SEM model. This finding is certainly incompatible with the theory that the increase of human capital in an area will increase economic growth in the area. But it can happen the mobility of human capital that is out of an area to another area with a high rate of economic growth. Vidyattama (2014) says that the negative relationship between human capital and economic growth is related to

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the pattern of migration from the people with relatively high education. The results of this study are not in line with the research results of SUN, YANG and ZHAO (2015) and Benos. N, Karagiannis. S, Karkalakos.S (2015).

The Influence of Catch-Up Technology

From Table 3, we can see that Catch-Up Technology has a negative and significant influence on $\alpha = 0.10$. This finding is certainly incompatible with the theory that the increase of Catch-Up Technology in an area will increase economic growth in the area. The results of this study are not in line with research results of Benos. N, Karagiannis. S, Karkalakos.S (2015), VO Pede et.al (2011), Benos, N et.al (2010).

In theory, however, these findings can be justified by using endogenous growth theory. Based on the endogenous growth model that is derived by Benhabib-Spiegel (1994), human capital factors reflect the effects of endogenous innovations in an area. Investment in human capital reflects the advancement of endogenous technologies which are related to the ability of a country to innovate domestically. The interactive influence of human capital and technology illustrate the influence of catch-up technology on technology leader areas. Catch-up technology is the technology diffusion from abroad or from other areas. The catch-up term suggests that the areas with lower initial productivity levels will experience a faster level of productivity growth than the total factor (by assuming a constant level of human capital).

From the basic theory above, the findings in this study indicate the ability to catch up with the low technology leaders that can also be caused by the low capability of human capital. This is in line with the findings of this study where the human capital factor has a significant negative influence on the economic growth of regencies/cities in Sumatra Island. This fact also shows the dominant role of human capital in technological advancement, where low human capital leads to low capability of catch-up technology so that it negatively influences economic growth in regencies/cities in Sumatra Island.

The Influence of Market Potential

Table 3 shows that Market Potential has positive and significant influence on $\alpha = 0.01$. Positive relationship means if the potential market increases then economic growth will increase and statistically significant.

When we consider, in the operational, market potential variables consists of GRDP/*PDRB* per capita and distance between regencies/cities components in Sumatra Island. Considering the use of distance spatial weighted matrix is capable of producing spatial models that meet the specifications which are statistically expected then the distance factor has clearly become an important factor causing significant market potential influence on the economic growth of the regencies/cities in Sumatra Island. Distance weighted matrix can be said to be equivalent to a distance which is relatively close to the regency/city center. When the market potential is expanded with a longer distance radius, the market potential influence becomes significant on the economic growth of the regency/city. This is because each area has enough market share to be utilized by each area so as to reduce the effect of competition between areas. This study is still in line with Bai, C.E, Hong MA and Wenqing PAN (2012), Bruna, F. *et.al* (2014) and Martínez-Galarrag J. *et.al* (2014).

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The Influence of Agricultural Sector Contributions

Table 3 shows that the contribution of the agriculture sector has a positive and significant influence on the economic growth of the regencies/cities in Sumatra Island at the level of testing $\alpha = 0.01$. The positive relationship is significant if the contribution of the agricultural sector increases then economic growth will increase and statistically its influence is considered real or significant.

These findings include important findings that explain the dominant role of the agricultural sector in every regency/city in Sumatra Island in influencing economic growth. From the descriptive illustration of agricultural sector variables, it is clear that the distribution of agricultural sector contribution in Sumatra Island is relatively evenly distributed. These findings are also in line with the study results of SUN, YANG and ZHAO (2015) but are not in line with Vidyattama (2014).

The Influence of Industry Sector Contributions

Table 3 shows that industry sector contribution has negative but not significant influence. As the result of the analysis is not statistically significant, this means that the rise or fall of industrial sector contribution has no significant influence on the economic growth of regencies/cities in Sumatra Island.

From the descriptive illustration of industry sector variables, it is clear that the distribution of industrial sector contribution in Sumatra Island is very uneven. Industrial centers are concentrated only in a few places, especially in the east coast of Sumatra, namely in Riau Province, North Sumatra, parts of South Sumatra and Lampung. While on the west coast of Sumatra is very low contribution. This finding supports why the influence of the industrial sector is insignificant to the economic growth of the regencies/cities in Sumatra Island. It is necessary to spread industrial centers so that they are more evenly distributed in every regency/city in Sumatra, especially in the industrial sector which is related to agriculture sector. Thus, the significant role of the agricultural sector still exists while the industrial sector is expanding and spreading.

This finding is in line with Vidyattama (2014), SUN, YANG and ZHAO (2015) for a positive relationship with economic growth and in line with and VO Pede, *et.al*., (2011) for a negative relationship with economic growth.

The Influence of Service Sector Contributions

Table 3 shows that the contribution of the service sector has a positive and significant influence on the economic growth of the regencies/cities in Sumatra Island at the testing level $\alpha = 0.01$. Positive relationship is significant if the contribution of the services sector increases then economic growth will increase and statistically its influence is considered real or significant.

From descriptive illustration of service sector variable, it is clear that distribution of service sector contribution in Sumatera Island is relatively uneven. Geographically, the distribution is quite evenly distributed in terms of regencies/cities with the contribution of service sector that are in the high and very high category are very evenly spread along the west coast of Sumatra island, while the regencies/cities with the contribution of the service sector that are low and very low are spread quite evenly in east coast. These findings are also in line with the study

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results of SUN, YANG and ZHAO (2015) but not in line with Vidyattama (2014).

The Influence of Economic Growth Spillover

Table 3 shows that the spillover of economic growth has a positive and significant influence on the economic growth of the regencies/cities on Sumatra Island at the level of testing α = 0.01. Spillover transmission of economic growth occurs through residual (λWu) where the influence is shown by coefficient λ = 0.3643 with p-value = 0.0000. It can be said that there is a significant influence of economic growth spillover (λWu) of neighboring regencies/cities on the economic growth of a regency/city in Sumatra Island at α = 0.01. If a district/city is surrounded by other regencies/cities within a distance radius of 360 Km, the influence of each regency/city which surround it is 0.3643 percent multiplied by the average error of the regencies/cities around it.

The finding of economic growth spatial Aspillover among regencies/cities in Sumatra Island supports previous findings which are conducted using Moran's I Global. If in Moran's I, we only sees spatial spillovers between regions without regarding to the determinants that cause the spillover, then in the spatial regression by using SEM and SAR models, they can be explored more deeply the determinants that support the spatial spillover of inter-regional economic growth.

The existence of evidence of economic growth spatial spillover between the areas in Sumatra Island gives meaning that economic growth in a regency/city in Sumatra Island is not only due to the influence of determinants that exist in a regency/city but also due to the economic growth of neighboring dregencies/cities. Thus development planning that takes into account the potential of an area will support the economic growth of the area and will indirectly influence the neighboring areas. This significant evidence of economic growth spatial spillover is an empirical reference for development planners to emphasize cooperation or synergy between regions for global progress and prosperity of regencies/cities, especially those that are in Sumatra Island.

The results of this study are in line with the research which is conducted by Ramírez and Loboguerrero (2002), Dekiawan, H (2014), SUN, YANG and ZHAO (2015) and Benos, Karagiannis, Karkalakos (2015) but not in line with the results of research which is conducted by K Sandberg (2004), Vidyattama (2014) which reveals a negative growth spillover from neighboring areas or regions to a particular area or region.

CONCLUSION

Based on the results of the analysis and discussion that has been done in the previous chapter, it is concluded that there is significant spatial dependence of economic growth among regencies/cities in Sumatra Island. Furthermore there is a positive and significant influence of economic growth spillover on neighboring districts/cities towards the economic growth of a regency/city in Sumatra Island. In addition there are positive and significant influence of labor, market potential, contribution of agriculture sector, contribution of service sector to economic growth of a regency/city in Sumatera Island. While human capital and catch-up technology have a negative and significant influence on the economic growth of a regency/city in Sumatra

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Island. For industrial sector contribution there is positive but not significant influence to economic growth of a regency/city in Sumatera Island.

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