Working Paper
in Economics and
Development Studies

Department of Economics
Padjadjaran University

No. 201104

Rise And Fall Of Cities, Measuring Spatial Clustering And Economies Of Urban Agglomeration In West Java

Rullan Rinaldi
Eva Nurwita

Department of Economics, Padjadjaran University

June, 2011

Center for Economics and Development Studies,
Department of Economics, Padjadjaran University
Jalan Cimandiri no. 6, Bandung, Indonesia.
Phone/Fax: +62-22-4204510
http://www.ceds.fe.unpad.ac.id

For more titles on this series, visit:
http://econpapers.repec.org/paper/unpwpaper/

RISE AND FALL OF CITIES, MEASURING SPATIAL CLUSTERING AND ECONOMIES OF URBAN AGGLOMERATION IN WEST JAVA

Research Report for 2nd SRG-10 Grant Competition 2011

Rullan Rinaldi and *Eva Nurwita*

Abstract

With others neighboring Provinces in the western part of Java, the West Java Province shares the southeast Asian most densely urban area (Bodebek as part of Jabodetabek and Greater Bandung). This research tries to identify the spatial clustering of urban economies activities using employment data from Economic Census of 2006 as proxy for urban agglomeration. Using the identification result, we then estimate aggregate production function of the urban agglomeration area to calculate it's economies of agglomeration.

From the result we found that both Bodebek and Greater Bandung metropolitan area are both have been reach the stage of saturation in their economic activity. Meanwhile, the alternative definition of Bodebek shows the stage of slight increasing return to scale, indicate the economies are trying to expand to regain the economies of scale that has been saturated in origin area.

1. Introduction

Urban agglomeration shares the benefits of efficiency in transportation and supporting industries, creating greater economies of scale. But just like other economic phenomenon, it came with a trade-off between the benefit and the cost. The benefit of urban agglomeration, for at least the last 30 years has been pointed out by urban economists resulted from spatial aggregation of population and industries (Mills ES, 1972; Dixit, 1973; Henderson, 1977; Kanemoto, 1980; Fujita 1989 in Zheng, 2000), while the diseconomies of urban agglomeration arose as its cost, which are commonly explained by urban problems such as traffic congestion and environmental degradation (Kawashima, 1975; Sveikauskas, 1975; Moomaw, 1998; Nakamura, 1985 in Zheng, 2005).

In his studies Kuncoro (2002) founds that the epicenter of manufacture industry as an indicator of urban agglomeration in Java as having a bipolar pattern on both western and eastern tip of the island. On the western part, along with the metropolitan of Greater Bandung (*Bandung Raya*), *Jabodetabek* Metropolitan comprising Jakarta and the surrounding region even has become the most densely populated urban region (Spreitzhofer, 2005). In Table 1, we can see that in 2010 the West Java Province was home to 18.12% of Indonesian population, while the area itself only comprises 1.83% of Indonesian soil.

Table 1. Population of Western Part of Java
Compared to National Population (in Thousands)

Year	1971	1980	1990	1995	2000	2010
Jakarta	4,579	6,503	8,259	9,112	8,389	9,607
West Java	21,623	27,453	35,384	39,206	35,729	43,053
Banten					8,098	10,632
Central Java	21,877	25,372	28,520	29,653	31,228	32,382
DI Yogyakarta	2,489	2,750	2,913	2,916	3,122	3,457
East Java	25,516	29,188	32,503	33,844	34,783	37,476
Indonesia	**119,208**	**147,490**	**179,378**	**194,754**	**206,264**	**237,641**
Share of Western Java	18.14%	18.61%	19.73%	20.13%	17.32%	18.12%

Source : Indonesian Central Bureau of Statistics, 2011

Furthermore, Hidayati and Kuncoro (2004) came out with a conclusion that there is a tendency that Greater Bandung Metropolitan will be merging with Jabodetabek Metropolitan as a result of Jabotabek's urban sprawl to east, and Greater Bandung's urban sprawl to west, creating network of cities along the path (Laquian, 1998, Kuncoro, 2000 in Kuncoro, 2004).

While both urban agglomeration (Greater Bandung and Jabodetabek) was considered to shares the benefit of economies of scale with high business density, . But, it is also come with a price, traffic congestion and environmental degradation was at least of it, Citarum (passing the Greater Bandung Metropolitan) and Ciliwung (passing the Jabodetabek) metropolitan, now has become one of the world's most polluted river (Ing and Resosudarmo, 2004; Suharyanto and Matsushita, 2009).

This research is trying to identify the urban agglomeration itself in a better quantitative approach using data with more details at sub districts (*kecamatan*) level, due to the fact that the pattern of urban agglomeration in West Java have spilled beyond municipalities/districts administrative border creating a network of cities, hence smaller measurement of spatial unit (ward) will result in a socio-economic analysis with higher resolution to better understand the phenomenon of urban agglomeration in the western part of Java.

2. Research Question

This exploratory research is trying to answer these questions:

1. Does urban agglomeration in West Java shows specifics spatial clustering pattern?
2. Does agglomerated urban area in West Java enjoy economies of scale?

3. Policy Context

In their 2005-2025 Spatial Plan, the West Java Provincial Government already identify the existing urban agglomeration yet have not been able to identify potential cost of the phenomenon. This research offers a second opinion of the urban agglomeration identification by industrial employment concentration and measurement of economies of scale of the urban agglomeration.

4. Literature Review

"Step back and ask, what is the most striking feature of the geography of economic activity? The short answer is surely concentration". Krugman (1981) in Tripathi (2010).

Since Marshall (1920), economists have recognized the propensity for industries to agglomerate across space. This effect is not an accident—spatial clustering results in increased returns and growth, as a consequence of localized economies of scale (Kominers, 2007).

Within the past decades, however, the "New Economic Geography" literature begun by Krugman (1991) has indicated that spatial agglomeration is quite common, where industries are more likely to be agglomerated than they are to be dispersed (Krugman, 1991 in Kominers, 2007).

Although, there is well known that urban agglomeration has its cost of urban congestion, the reduced transport costs within an agglomeration lead to "physical spillovers," as discussed by Krugman (1991); these spillover effects were found by Ciccone and Hall (1996) to be sufficient to offset congestion effects.

This research intend to fill the discussion by providing an empirical measurement of the economies of scale of urban agglomeration for the case of West Java Province. Furthermore, the methodology that this research employed, also allows us in addition to estimate the specific economies of scale of sub district in West Java to determine whether the economic activity in the area have been reached its saturation or not.

5. Analytical Methods and Result

5.1 Identification of Urban Agglomeration

There are several alternative that can be used to identify urban agglomeration, but in general it can be classified into two distinctive method i.e. discrete-indices (such as Ellison and Glaeser Index in Ellison and Glaerser, 1997) and spatial-continuous-indices (such as density-distance based function in Duranton and Overman, 2005).

Constrained by data deficiencies, we turn to a working paper by Guillain and Le Gallo (2007), which combined discrete-space and continuous-space model. They employ locational Gini index and Moran's I Coefficient of cities in metropolitan of Paris, ans use both Moran Scatterplot and Local Indicators of Spatial Associations (LISA Statistics) to look for spatial autocorrelation, that they claim to be an indicative measurement of actual agglomeration.

Although there is another simple method of *Location Quotient* to spatially delimit agglomeration, both the method raises two main problems. First several cut-offs have been used since there is no theoretical or empirical agreement as to how larger an LQ should be to indicate clustering (Martin and Sunley, 2003; O'Donoughe and Gleave, 2004 in Gullain and Le Gallo, 2007).

Specifically, to identify agglomeration through Moran's Scatterplot, first we have to estimate Moran's *I* statistics as a measurement of spatial autocorrelation that can be defined as the coincidence between value similarity and locational similarity (Anselin, 2001). Moran's *I* can be estimated using the equation below :

$$I_m = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\left(x_i - \overline{\mu}_x\right)\left(x_j - \overline{\mu}_x\right)}{\sum_{i=1}^{n}\left(x_i - \overline{\mu}_x\right)} \qquad \textbf{(1)}$$

Where I_m is Moran's *I* Coefficient of every sub district for industrial sector *m*, and $(x_i - \mu_x)$ is deviation of region i value from the mean, $\Sigma_i W_{ij}$ is deviation from neighboring area j values from the mean, and W_{ij} itself is one element of the row-standardized spatial weight matrix *W*, which represent spatial interconnection between sub district *i* and *j*.

To be able to composing the Moran Scatterplot, we have to estimate local Moran's I Coefficient for each specific district for industrial sector *m*. The local Moran's I Coefficient itself, was computed using the formula as follows (Following Anselin, 1995),

$$I = \frac{(x_i - \bar{\mu}_x)}{m_0} \sum_j w_j (x_j - \bar{\mu}_x) \quad \text{with} \quad m_0 = \sum_i (x_i - \bar{\mu}_x)^2 / n \qquad \textbf{(2)}$$

The local Moran's *I* Coefficient imply 4-way split of the sample where not only cluster of high or low values are detected, but also "a typical locations", where it is situated among others high(low).

Labor concentration was employed as a proxy for identifying agglomeration phenomenon following Gullain and Le Gallo (2007). From the result that can be seen in Table 2, either the identification classified by industrial sector and scale gave similar result of the existence of spatial autocorrelation of labor concentration. Whilst industrial sector identification of spatial clustering gave us the information regarding localized economies of each sector, the industrial scale gave us the information of how industrialization magnitude aggregated through space.

Meanwhile, for the aggregate identification of urban agglomeration, total employment data from firms in each sub district was used to shows approximately which region can be classified as an urban agglomerated area. The urban agglomeration area itself was classified in this paper as those that having typical location similarities of labor concentration in a contiguous area, represented by high-high cluster (cluster of high value of labor concentration situated among others that also having high value of labor concentration) in LISA Cluster Map of total employment data, as can be seen in Figure 1, detailed LISA Cluster Map for each industrial sectors and scale are provided in the appendix.

Table 2. LISA Identification Result

Industry	Global Moran's *I* Coefficient	*p*-value			Number of Sub District by LISA Cluster*				
		1-tail	2-tail		HH	HL	LL	LH	Not Significant
Industrial Sector :									
Mining	0.015	0.000	0.000	***	19	13	0	0	561
Manufacture	0.053	0.000	0.000	***	55	4	46	28	460
Utilities (Electricity, Gas, and Water)	0.004	0.018	0.036	**	22	7	0	3	561
Construction	0.083	0.000	0.000	***	81	12	125	48	327
Commerce/Trade	0.144	0.000	0.000	***	111	17	171	61	233
Food and Accomodation	0.157	0.000	0.000	***	109	13	171	65	235
Transportation	0.144	0.000	0.000	***	85	12	118	56	322
Financial	0.074	0.000	0.000	***	50	6	0	12	525
Real Estate	0.125	0.000	0.000	***	87	2	112	35	357
Education	0.073	0.000	0.000	***	89	17	95	40	352
Health and Social Services	0.074	0.000	0.000	***	60	11	70	35	417
Entertainment	0.159	0.000	0.000	***	102	13	136	66	276
Individual Services	0.028	0.000	0.000	***	36	6	0	6	545
Industrial Scale :									
Household Industries	0.108	0.000	0.000	***	110	24	135	52	272
Small Industries	0.127	0.000	0.000	***	113	12	108	44	316
Medium Size Industries	0.121	0.000	0.000	***	88	6	83	45	371
Large Size Industries	0.066	0.000	0.000	***	55	1	0	18	519

* p-value cutoff point for Local Moran's I (LISA) is 0.1 (10%)

HH = High – High

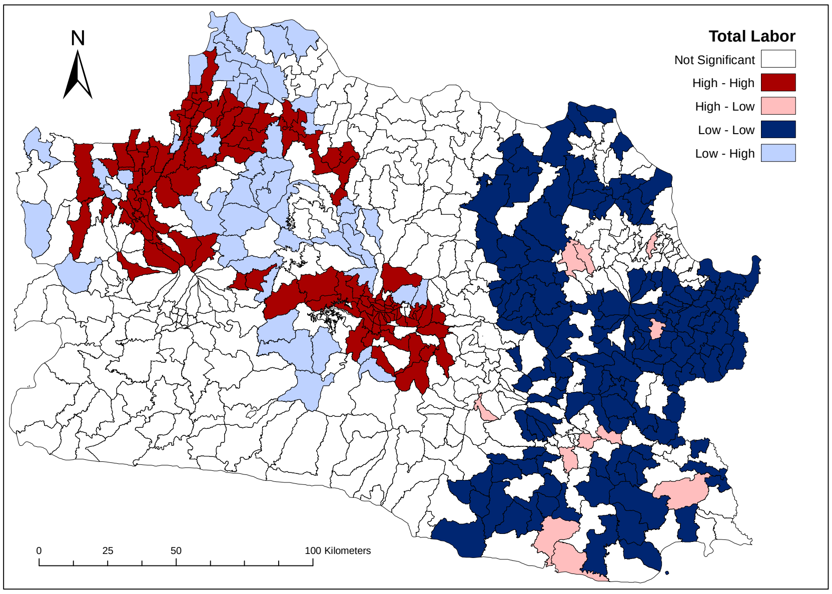
HL = High - Low

LL = Low - Low

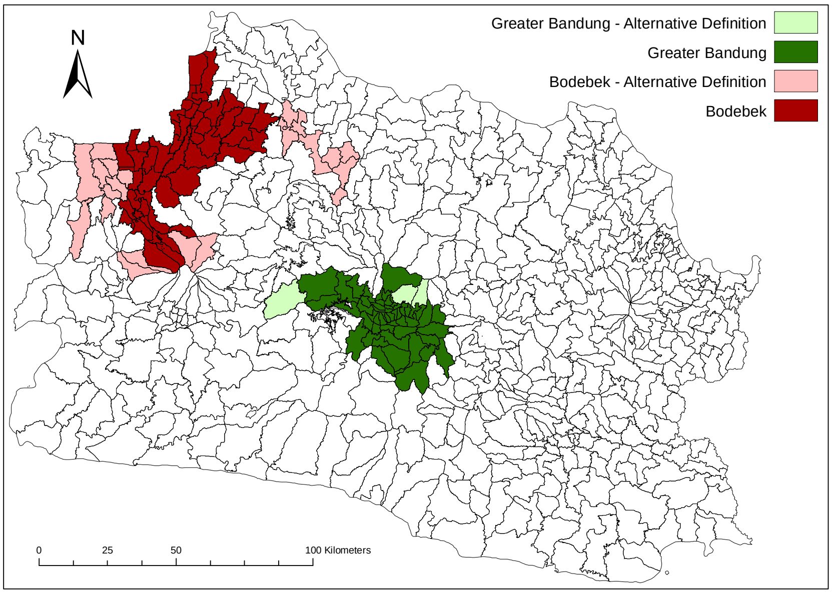
LH = Low - High

Source : Author's Calculation

Figure 1. LISA Cluster Map and Agglomeration Identification of Total Employment



(a) LISA Cluster Map for Total Employment)



(b) Urban Agglomeration Identification as Contiguous Area

From the figure above, the darker area (dark red and dark green) representing area that are classified as a "high-high" cluster in LISA cluster map in a contiguous area, which confirm common definition (West Java Spatial Plan, Local Regulations No.47, 1997 and Presidential Decree No. 54, 2008 regarding Spatial Plan In Region Jakarta, Bogor, Depok, Tangerang, Puncak, and Cianjur -- *Jabodetabekpunjur*). Meanwhile lighter shaded (red and green) areas are those classified as a part of agglomeration area (either Bodebek or Greater Bandung) in our analysis, which not mentioned in the common definition and we called this area as an alternative definition of Bodebek and Greater Bandung throughout this paper.

Interestingly, if we considered the alternative definition of Bodebek as its expansion path, the the metropolitan area in 2006 are expand itself to the eastern area of the common definition. It is moving east from *Teluk Jambe* sub district in the district of Karawang through Purwakarta sub distrik in the district of Purwakarta. These findings conform in a certain degree with Amini and Kuncoro (2004), Amini and Kuncoro themself stated that the *Jabotabek* metropolitan area will eventually merge with Greater Bandung by its movement to the east through the district of Karawang and Purwakarta, nevertheless higher resolution data (sub district level data) employed in this paper shows that the merging process has not perfectly "merge" yet, the process has not reach the area of Greater Bandung for the moment.

5.2 Measuring The Benefit of Urban Agglomeration and The Optimal Size of a City

Following the definition of urban agglomeration in previous section (Figure 1 b), we generate the aggregate production function from sub district (*kecamatan*) level data for the metropolitan of Bodebek and Greater Bandung are used to obtain the magnitudes of urban agglomeration economies. Following Kanemoto (1995) for Japanese Case, and Tripathi (2010) for Indian Case, with the exclusion for social overhead capital[1] the aggregate production function is written as,

$$Y = f(L, K) \tag{3}$$

Where L, K, and Y are the numbers of persons employed, the amount of private capital, and the total production of metropolitan area, respectively. This research will specify simple Cobb-Douglas production function:

$$Y = AK^{\alpha}L^{\beta} \tag{4}$$

and estimate its logarithmic form, such that :

$$\ln(Y/L) = A_0 + \alpha_1 \ln(K/L) + \alpha_2 \ln L \tag{5}$$

[1] Estimation with the inclusion for social overhead capital (as can be seen in Kanemoto (1995) and Tripathi (2010) was not feasible for West Java case due to deficiencies of data.

Where Y, K, and N total production, private capital stock, and employment in consecutive order in a metropolitan. The relationship between the estimated parameters in (4) and the coefficient in the Cobb-Douglas production function (3) are $\alpha = \alpha_1$, $\beta = \alpha_2 + 1 - \alpha_1$. The estimation result of α_2 will provide us a comparable measurement of agglomeration economies magnitudes between metropolitan area.

Meanwhile the sum of coefficient of the equation excluding the constant will yield a measurement of economies of scale, where the value of 1 representing the condition of constant return to scale, if it is below 1 then it is representing the condition of decreasing return to scale and vice versa if it is above 1.

5.2.1 Ordinary Least Square Estimation

Using the specification in equation (5), we estimate an OLS regression of Cobb-Douglass production function with the addition of control variable consisting of infrastructure variables (the length of toll road and non-toll road relative to each district's size). In Table 3, we can see the result of the estimation for each urban agglomeration area (using common and alternative definition) and West Java as a whole.

Table 3. OLS Estimation Result of Aggregate Production Function

Parameter	West Java		Bodebek		Bodebek (Alternative Definition)		Greater Bandung		Bandung Raya (Alternative Definition)	
Constant	11.806	***	14.238	***	13.416	***	13.855	***	13.664	***
Log Capital	0.058	***	0.068	*	0.045		0.037		0.037	
Log Labor	1.467	***	1.218	***	1.356	***	1.337	***	1.355	***
Log Toll	-0.293	***	-0.326	***	-0.383	***	0.132		0.144	
Log Non Toll	0.022	***	-0.019		0.039		0.132	***	0.124	***
R-Square	0.774		0.811		0.820		0.615		0.717	
F-Stat	660.77	***	55.82	***	105.12	***	18.24	***	41.2	***
Obs	593		48		67		51		54	
Economies of Scale	**1.254**		**0.941**		**1.057**		**1.637**		**1.659**	

Source : Author's Calculation

From Table 3, we can observe that Greater Bandung in common definition still has increasing return to scale although, the alternative definition gave greater number of the condition of increasing return to scale. This implies that although the economic activity in Greater Bandung (in common definition) has not reach saturation, but it is already has the tendency to expand in search for greater economies of scale.

Interestingly, estimation result showed that Bodebek (in common definition) has reached the stage of decreasing return to scale, indicate the economic activity in the area has been saturated. Meanwhile, the alternative definition of Bodebek shows the stage of slight increasing return to scale, indicate the economies are trying to expand to regain the economies of scale that has been saturated in origin area.

5.3 Geographically Weighted Regression Estimation

In addition of estimation using Ordinary Least Square, we also estimate the aggregate production function using Geographically Weighted Regression to avoid the cost caused by OLS that we will lose the information of specific coefficient for each observation. Hence, using Geographically Weighted Regression will allow us to have a specific coefficient of economies of scale for every spatial unit (in this case is sub district/*kecamatan*).

For this purpose, we apply Geographically Weighted Regression (GWR) techniques of Fotheringham et al. (2002) that allows for variability in the parameters. Consider a global regression model written as:

$$y_i = \beta_0 + \sum_k \beta_k x_{ik} + \varepsilon_{ik} \quad \textbf{(6)}$$

GWR extend the global regression estimated by traditional Ordinary Least Square by allowing local rather than global parameters to be estimated, so that the model is rewritten as:

$$y_i = \beta_0(u_i, v_i) + \sum_k \beta_k(u_i, v_i) x_{ik} + \varepsilon_{ik} \quad \textbf{(7)}$$

Where (u_i,v_i) denotes the coordinates of the i^{th} point in space and $\beta_k(u_i,v_i)$ is a realization of the continuous function $\beta_k(u)$ at point i. That is, we allow there to be continuous surface of parameter values, and measurements of thus surface are taken at certain point to denote the spatial variability of the surface. Equation 9 is a special case of equation 8 in which the parameters are assumed to be spatially invariant. Thus the geographically weighted regression equation in 9 recognizes that spatial variations in relationships might exist and provides a way in which they can be measured.

The inclusion of index i implies that equation (7) is not a single equation, but a set of n equations where the dimensions of A are $n \times 1$ localized regression estimates, where each observations is given a certain weight such that neighboring districts have more influence on the parameters than those located farther away (Seldadyo, 2007).

5.3.1 Testing Individual Parameter Stationarity

An earlier perhaps more pragmatic, approach to inference about GWR models was outlined in Fotheringham et al. (1996), that allows us testing the stationarity of individual parameter based on measuring their variability over space when estimated using GWR. The method is carried out as follows : a GWR estimate of the coefficient of interest in takes at each of the n data points and the variance (or standard deviation) of these estimates is computed. If the variance for parameter k is termed V_k then

$$V_k = \frac{1}{n}\sum_{i=1}^{n}\left(\hat{\beta}_{ik} - \frac{1}{n}\sum_{i=1}^{n}\hat{\beta}_{ik}\right) \quad \textbf{(8)}$$

Of course, even if the parameter of interest did not vary geographically, one would expect to see some variation in the estimated local values of the parameter. The question here is whether the observed variation is sufficient to reject the hypothesis that the parameter is globally fixed. To do this, consider the null distribution of the variance under this hypothesis. If there is no spatial pattern in the parameter, the any permutation of the regression variables against their locations is equally likely and on this basis we can model the null distribution of the variance.

5.3.2 GWR Estimation Result

Cartographical representation of GWR estimation result can be seen in Figure 2 - Figure 7, while its stationarity test can be seen in Table 4. From the test, we can observe that all variable are recognized to be involved in non-stationarity process over space except for non-toll road and constant.

From Figure 3, we can see that capital has greater elasticity not in either Bodebek or Greater Bandung metropolitan but instead in the area between them. In this area, capital is having greater impact in increasing the aggregate output. But still, both Greater Bandung and Bodebek has greater coefficient than any other area (excluding the area between them mentioned before, and some area in the southern part of West Java) in West Java.

Table 4. GWR Estimation Result – Non Stationarity Test

Independent Variables	Coefficient for Global Model	p-value for Global Model		GWR Output			Non-Stationarity Test		% Outliers
				$\bar{\beta}_j$	β_j^{min}	β_j^{max}	$\sigma^2_{\beta_j}$	Sign.	
Significance Test For Non-Stationarity									
Capital	0.058	0.000	***	0.021	-0.098	0.146	0.0509		11.635
Labor	1.435	0.000	***	1.354	0.964	1.721	0.1396		12.310
Infrastructure :									
Toll Road	0.517	0.003	***	0.451	-3.928	4.090	0.8950		7.757
Non-Toll Road	0.109	0.001	***	1.052	-0.901	3.308	0.9592	***	11.804
Constant (Technology)	12.071	0.000	***	13.487	9.639	19.124	1.6983	**	8.937
R^2 for Global Model	0.77								
F-stat for Global Model	498.31		***						
Significance Test For Bandwidth :									
Bandwidth	0.2393							***	

Outlier are identified as those outside the range of $\bar{\beta}_j \pm \sigma^2_{\beta_j}$

Source: Author's Calculation

Meanwhile, in Figure 4, we can observe that northern part of both metropolitan (Bodebek and Greater Bandung has the greatest elasticity for labor along with area in the western part of Bodebek, and certain area in southern West Java and eastern West Java which shares border along with Central Java. From the figure, we can also observe that "inner part" of Bodebek area that shares connectivity with its "core" (Jakarta) has lower elasticity of labor compare to other area surrounding it (fringe region), and the difference even greater with the area in the eastern part of Bodebek (such as Karawang and Purwakarta). The phenomenon shows similar pattern in Greater Bandung, where the metropolitan has lower elasticity of labor compared to area surrounding it. From these findings, we can conclude that Greater Bandung along with inner part of Bodebek has its saturated stage of labor concentration so it gave less marginal return in output for any additional input in labor.

For infrastructure variable, we can observe that Toll Road has its greatest impact in output for the area situated between Bodebek and Greater Bandung, plotted against road infrastructure layer in Figure 5, these finding conform the pattern of expansion area of Bodebek in previous section (Figure 1) and conclude that the expansion itself was mainly driven by Toll Road infrastructure connecting the area with Bodebek.

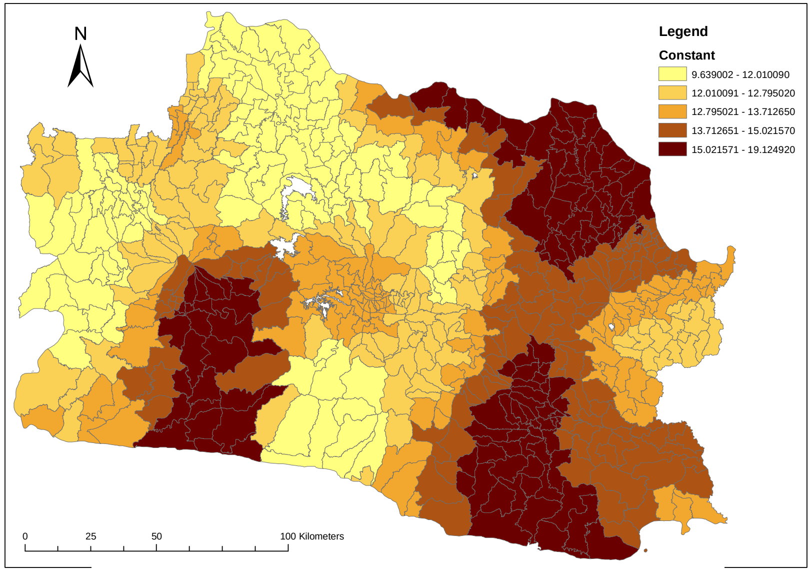


Figure 2. GWR Output - Constant

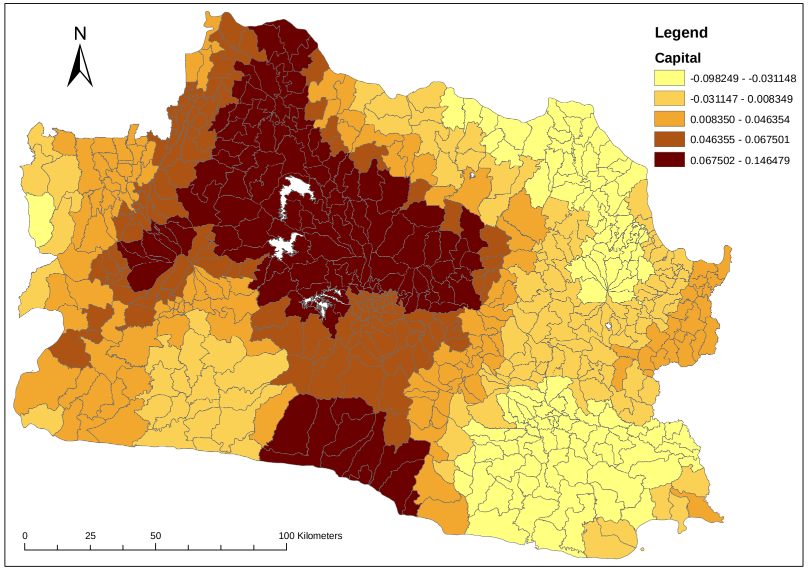


Figure 3. GWR Output – Log(Capital)

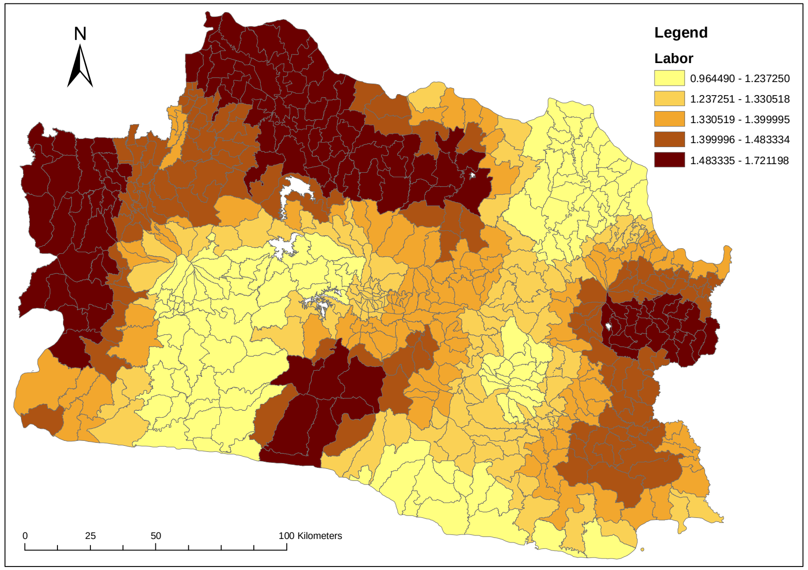


Figure 4. GWR Output – Log(Labor)

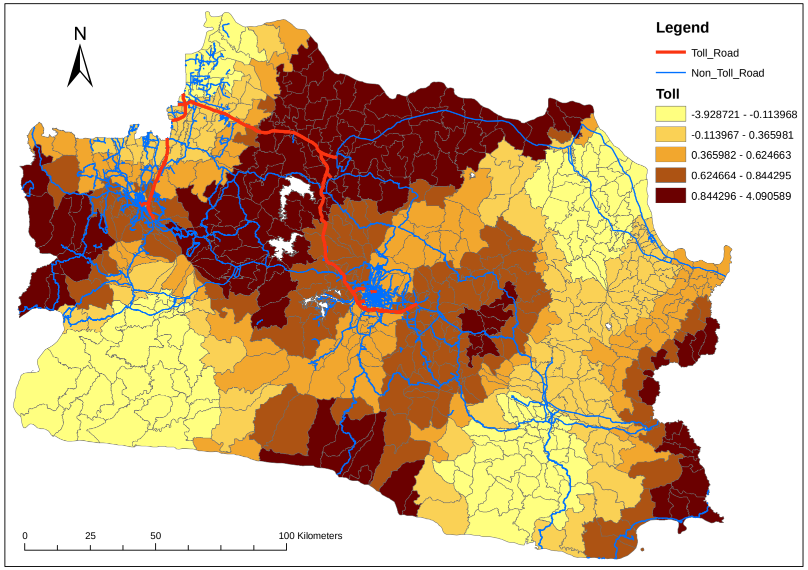


Figure 5. GWR Output – Log(Toll Road)

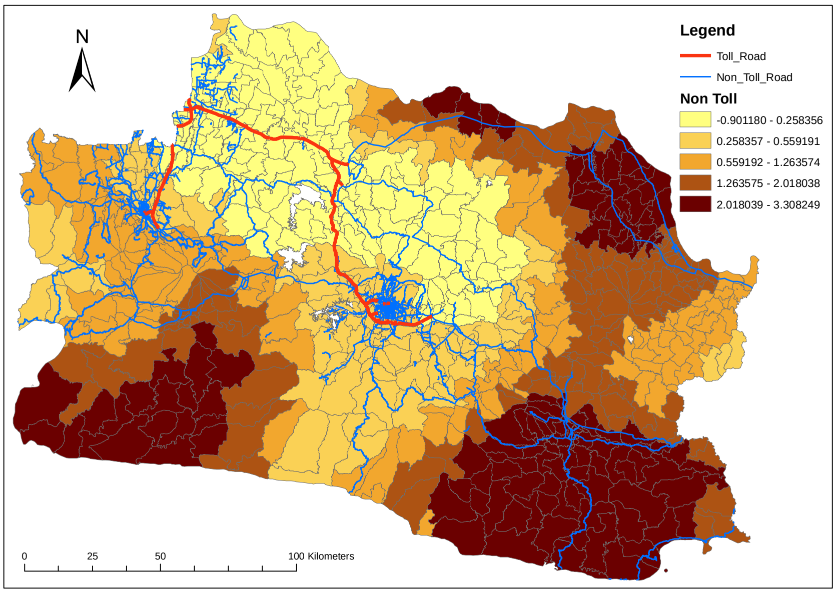


Figure 6. GWR Output – Log(Non Toll Road)

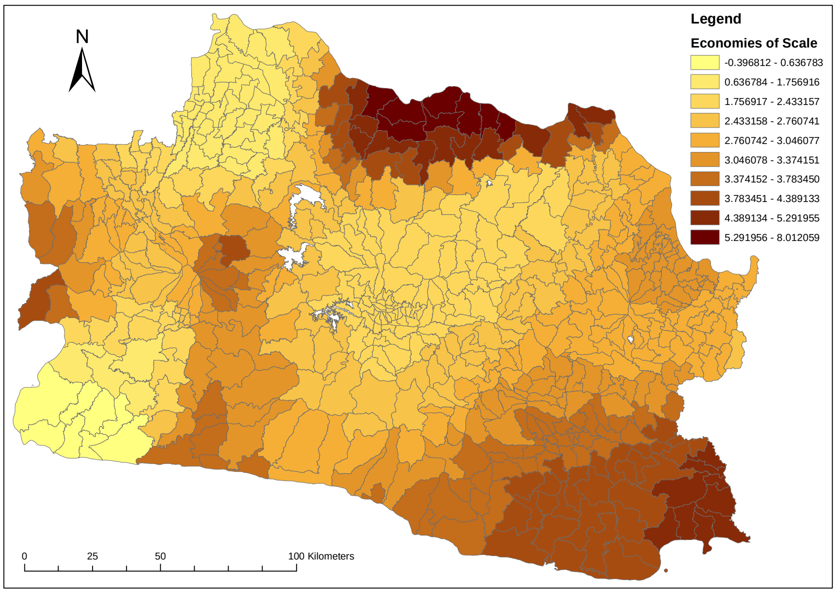


Figure 7. GWR Output – Economies of Scale

Meanwhile Non Toll Road has greater elasticity in area such as in the northeastern part of West Java (*Pantura – Pantai Utara Jawa* or northern coastal area of Java), and southern and southeastern part of West Java. The area itself were the area that have less road infrastructure compared to other area in West Java, hence infrastructure development in those area hold the key to increase their output.

From Figure 7, we found that both Bodebek and Greater Bandung metropolitan area are both have been saturated in their economic activity, especially in the northern part of Bodebek that shares direct border with its core region (Jakarta) resulted in lower economies of scale (it is already reach the stage of decresing return to scale in some part of Bodebek, but the figure also reveal that area which in the previous section considered to be part of Bodebek in alternative definition still has increasing return to scale, conform the finding from OLS estimation in Table 3, which conclude that Bodebek (in common definition) has reached the stage of decreasing return to scale, indicate the economic activity in the area has been saturated. Meanwhile, the alternative definition of Bodebek shows the stage of slight increasing return to scale, indicate the economies are trying to expand to regain the economies of scale that has been saturated in origin area.

6. Conclusion

This paper found that Bodebek has expand from its origin (common definition), the expanded area (alternative definition) itself spanned in the eastern area of the common definition. It is moving east from *Teluk Jambe* sub district in the district of Karawang through Purwakarta sub distrik in the district of Purwakarta. These findings conform in a certain degree with Amini and Kuncoro (2004), Amini and Kuncoro themself stated that the *Jabotabek* metropolitan area will eventually merge with Greater Bandung by its movement to the east through the district of Karawang and Purwakarta, nevertheless higher resolution data (sub district level data) employed in this paper shows that the merging process has not perfectly "merge" yet, the process has not reach the area of Greater Bandung for the moment.

We also found that both Bodebek and Greater Bandung metropolitan area are both have been saturated in their economic activity, especially in the northern part of Bodebek that shares direct border with its core region (Jakarta) resulted in lower economies of scale (it is already reach the stage of decresing return to scale in some part of Bodebek, but the figure also reveal that area which in the previous section considered to be part of Bodebek in alternative definition still has increasing return to scale, conform the finding from OLS estimation. Meanwhile, the alternative definition of Bodebek shows the stage of slight increasing return to scale, indicate the economies are trying to expand to regain the economies of scale that has been saturated in origin area.

References

Anselin, L. (1995) Local Indicators of Spatial Association-LISA, *Geographical Analysis* 27, 93-115

Anselin, L. (2001) Spatial econometrics, in Baltaqi B. (Ed) Companion to Econometrics, pp. 310-30. Basil Blackwell, Oxford

Dixit A. (1973) The Optimum Factory Town. *Bell Journal of Economics and Management Science* 4:637–51.

Duranton and Overman, H.G. (2005) Testing for Localization using Micro-Geographic Data, *Review of Economic Studies* 72(4), 1077-106

Ellison, G. and Glaeser, E.L. (1997) Geographic Concentration in U.S. Manufacturing Industries : A Dartboard Approach. *Journal of Political Economy* 105(5):889-927

Flatters, F., V. Henderson and P. Mieszkowski (1974) Public Goods, Efficiency, and Regional Fiscal Equalization. *Journal of Public Economics* 3, 99-112

Fotheringham, A. S., Brunsdon, C., and Charlton, M. (2002). Geographically Weighted Regression : The Analysis of Spatially Varying Relationship. West Sussex: John Wilye & Sons Ltd.

Fujita M. Urban Economic theory: land use and city size. New York: Cambridge University Press, 1989.

Guillain, R. and Le Gallo, J. Agglomeration and Dispersion of Economic Activities in Paris and Its Surrounding : An Exploratory Spatial Data Analysis. Working Papers presented at the 51th North American Meeting of the Regional Science Association International, Seattle (USA), November 11–13, 2004; at the 45th Congress of the European Regional Science Association, Amsterdam (Netherlands), August 23–27, 2005; at the International Workshop on Spatial Econometrics and Statistics, Rome (Italy), May 25–27, 2006; at the LET Seminar, Université Lyon II, Lyon (France), November 6, 2006 and at the CESAER Seminar, UMR INRA-ENESAD, Dijon (France), January 29, 2007

Henderson JV. (2007) Economic Theory and the Cities. New York: Academic Press, 1977.

Ing, L.Y. and Resosudarmo, B. (2004) River Water Quality Improvement : An Application of The Contingent Valuation Method to Ciliwung River, Indonesia. in A.S. Alisjahbana and B.P.S. Brodjonegoro (eds), Regional Development in the Era of Decentralization: Growth, Poverty and the Environment, Bandung: UNPAD Press, pp. 293-306

Joseph Stiglitz: October 2002 Interview with Christopher Williams, of the Robert Schalkenbach Foundation,published in Geophilos, Spring, 2003

Kanemoto Y. (1980) Theories of Urban Externalities. Amsterdam: North-Holland

Kanemoto, Y.; Kitagawa, T.; Saito, H. and Shioji, E. (1995) Estimating Urban Agglomeration Economies for Japanese Metropolitan Areas: Is Tokyo Too Large?. Chapter in Book *GIS-Based Studies in the Humanities and Social Sciences* by Atsuyuki Okabe, Tokyo. Published in 2005.

Kawashima T. (1975) Urban Agglomeration Economies in Manufacturing Industries. *Papers of Regional Science Association* 34:155–75.

Kominers, S.D. (2007) Measuring Agglomeration. *Harvard Urban and Social Economics seminar (Economics 2800b)*.

Krugman, P. (1981) Industry Specialization and the Gains from Trade. Journal of Political Economy, Vol. 89, No.5, pp. 959-972

Krugman, P. (1991) Increasing Returns and Economic Geography. The Journal of Political Economy 99(3): 483–499.

Kuncoro, Mudrajad. (2002), *Analisis Spasial dan Regional: Studi Aglomerasi dan Kluster Industri Indonesia*, UPP AMP YKPN

Laquian, A. A. (1998), Summary of Deliberations at the Conference on Mega-Cities, Beijing, 1996, Ekistics Athens, Jan/Feb-May/Jun 1998.

Martin R. and Sunley, P. (2003) Deconstructing Clusters: Chaotic Concept or Policy Panacea? *Journal of Economic Geography* 3, 5-35

Mills ES. (1972) Studies in the Structure of the Urban Economy. Baltimore, MD: Johns Hopkins University Press

Moomaw RL. (1998) Agglomeration Economies: Are They Exaggerated by Industrial Aggregation?. *Regional Science and Urban Economics* 28:199–211.

Moomaw RL.(1981) Productivity and City Size: A Critique of the Evidence. *Quarterly Journal of Economics* 96:675–88.

Nakamura R. (1985) Agglomeration Economies in Urban Manufacturing Industries: a case of Japanese cities. *Journal of Urban Economics* 17:108–24.

O'Donoghue D. and Gleave B. (2004) A Note on Methods for Measuring Industrial Agglomeration, *Regional Studies* 38, 419-27

Seldadyo, H. (2007). Geography and Governance: Does Space Matter? PhD thesis, Chapter in Disserations, University of Groningen.

Spreitzhofer, G. Post-Suharto's Jabotabek Region : New Issues of Demographic and Socio-Economic Change in Western Java, Malaysian Journal of Society and Space, 2005;1:1-10

Suharyanto and Matsushita, J. Integrated Basin-Based Wastewater Management System for Water Pollution Control in Enclosed Water Body of Upper Citarum River Basin, Indonesia : Case of Saguling Reservoir. 13th Conference Wuhan 2009 Conference Papers.

Sveikauskas L. (1975) The Productivity of Cities. Quarterly Journal of Economics 89:393–413.

Tripathi, S. Estimating urban agglomeration economies for India: a new economic geography perspective Dimensions of Innovation and Growth", Dimetic Pecs 2010 Session of the DI-METIC Programme "Regional and Policy Dimensions of Innovation and Growth", Pecs (Hungary), 5th to 16th July, 2010

Zheng, Xiao-Ping (2001) Determinants of Agglomeration Economies and Diseconomies : Empirical Evidence from Tokyo. Socio-Economic Planning Sciences 35:131-144.

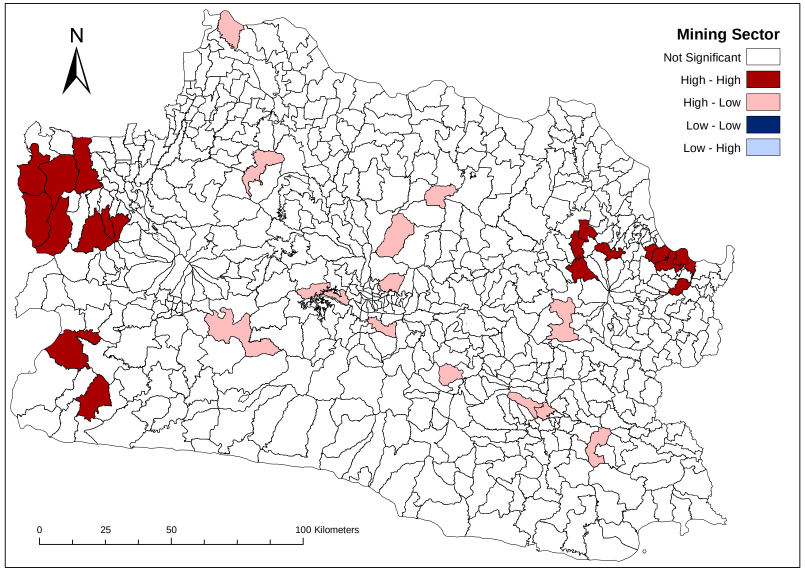


Figure 8. Mining Sector Cluster Map

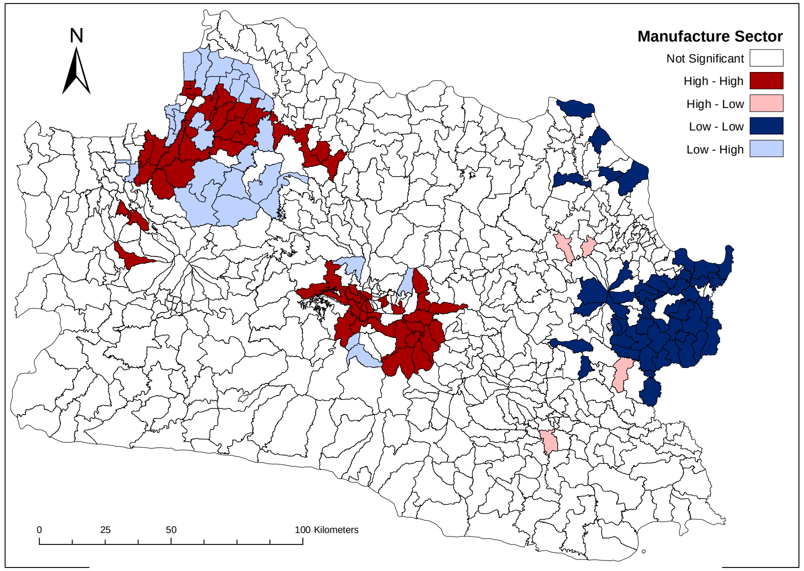


Figure 9. Manufacture Sector Cluster Map

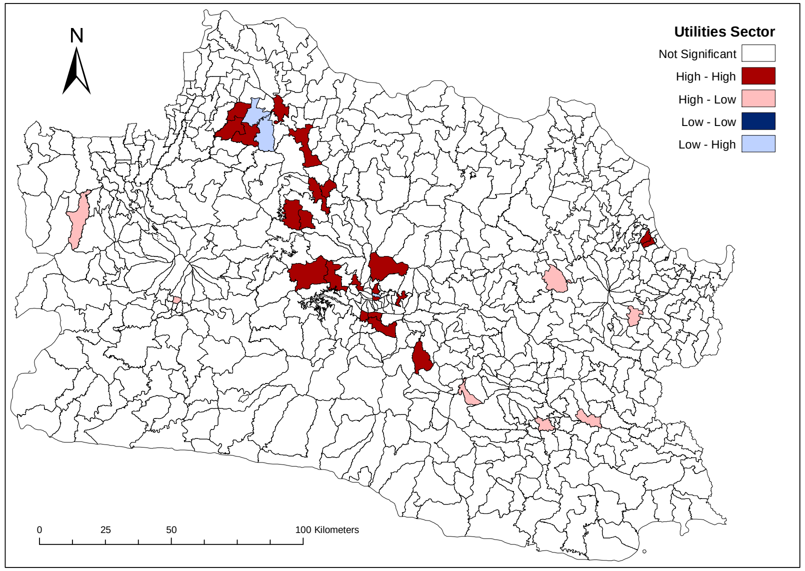


Figure 10. Utilities Sector Cluster Map

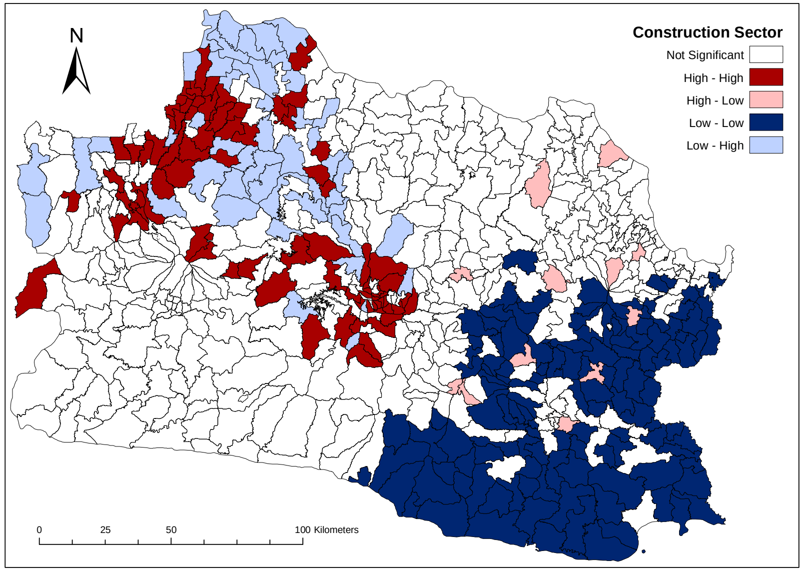


Figure 11. Construction Sector Cluster Map

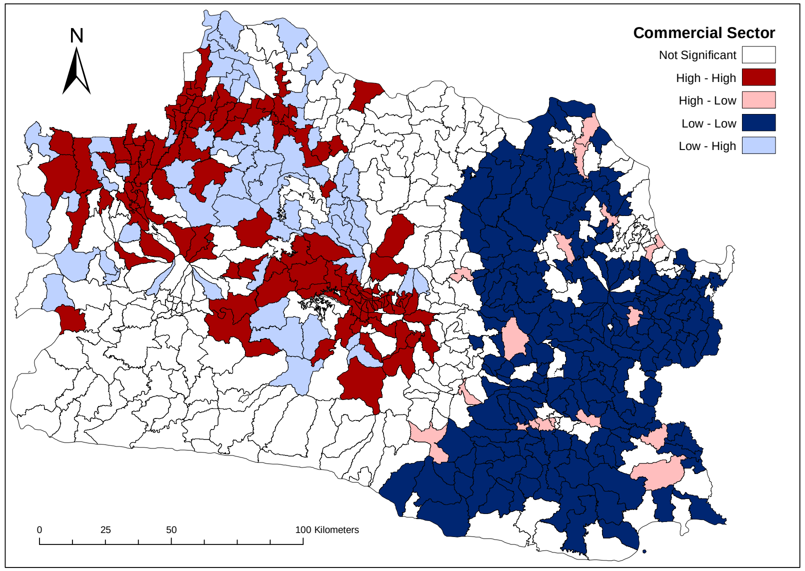


Figure 12. Commerce/Trade Sector Cluster Map

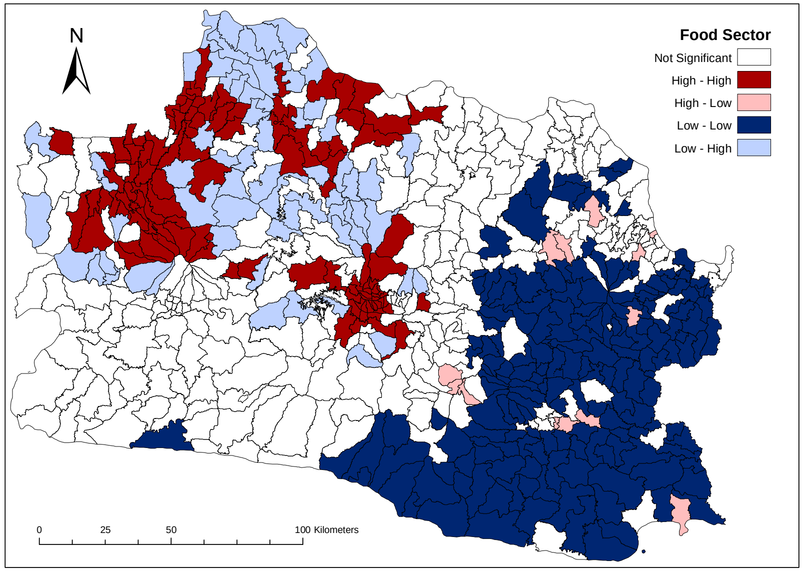


Figure 13. Food Sector Cluster Map

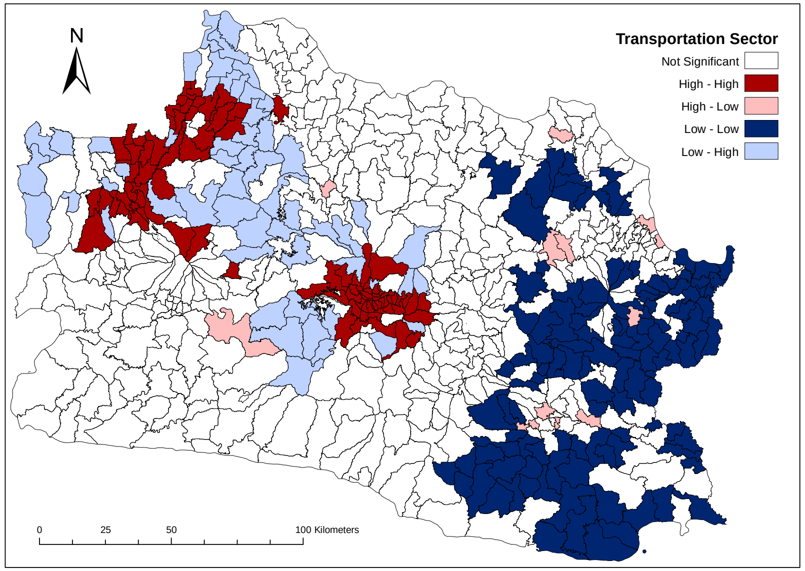


Figure 14. Transportation Sector Cluster Map

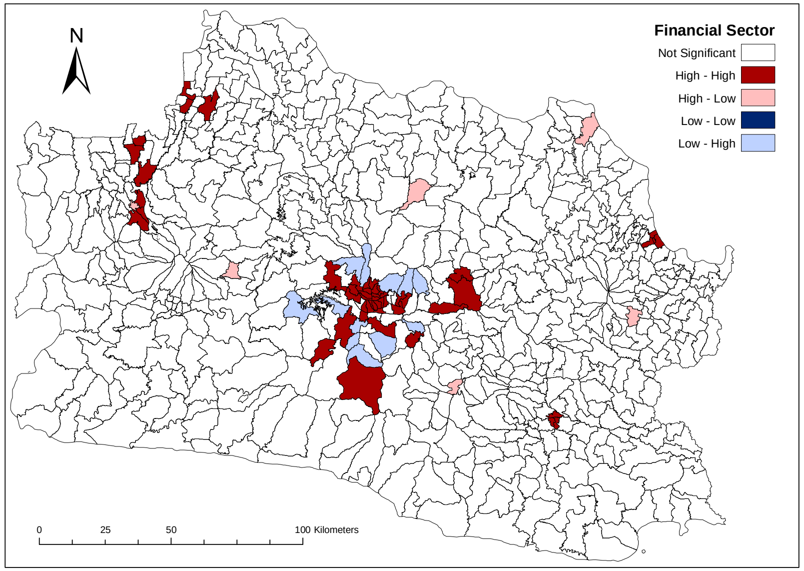


Figure 15. Financial Sector Cluster Map

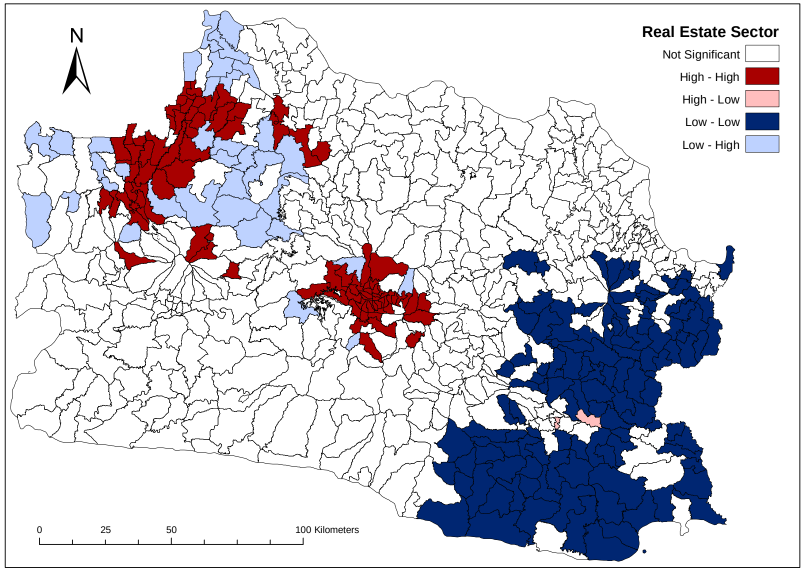


Figure 16. Real Estate Sector Cluster Map

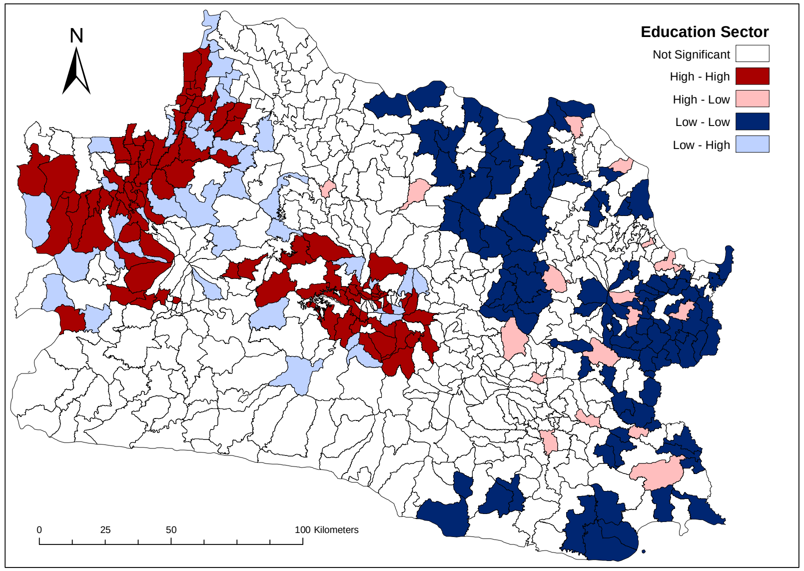


Figure 17. Education Sector Cluster Map

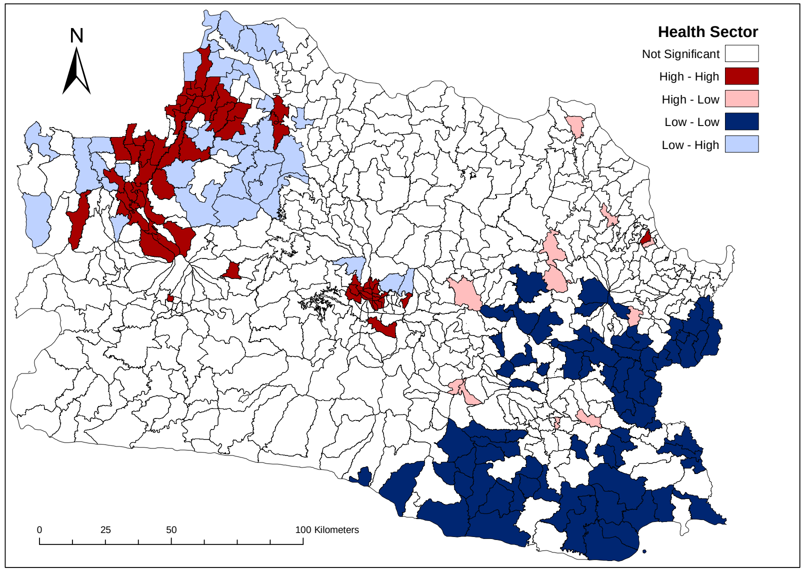


Figure 18. Health Sector Cluster Map

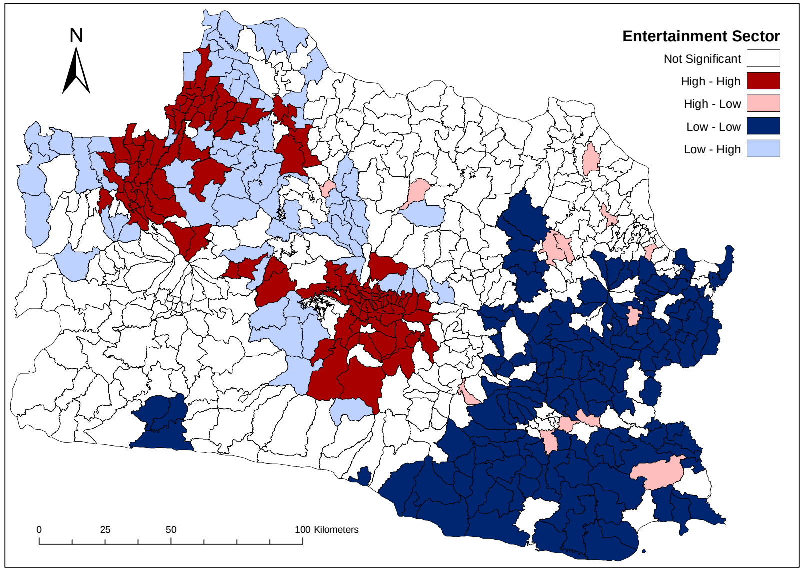


Figure 19. Entertainment Sector Cluster Map

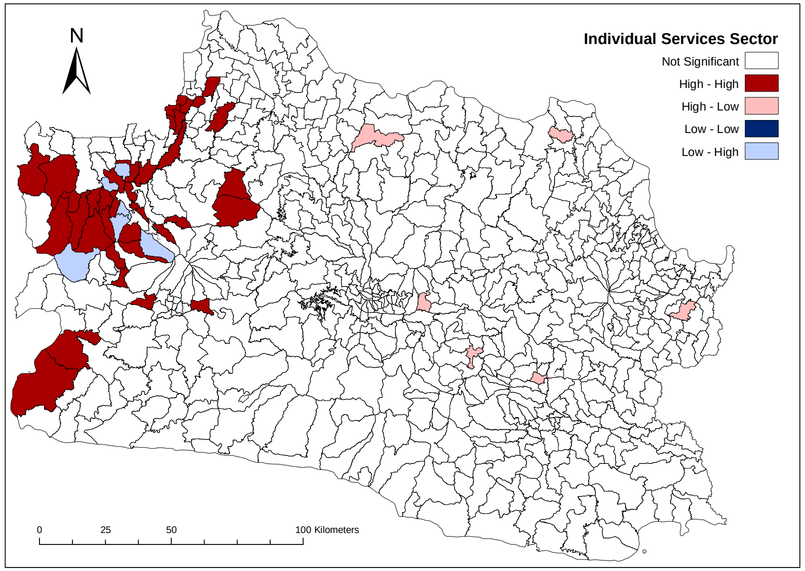


Figure 20. Individual Services Sector Cluster Map

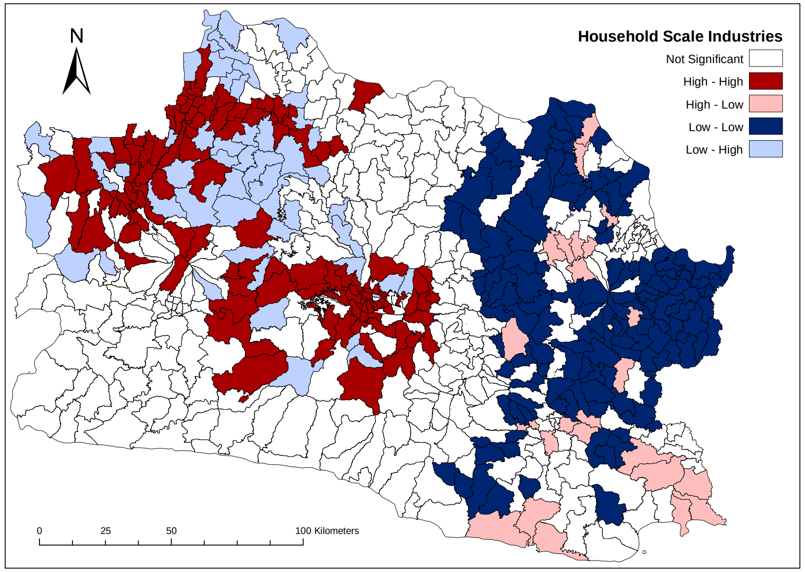


Figure 21. Household Scale Industries Cluster Map

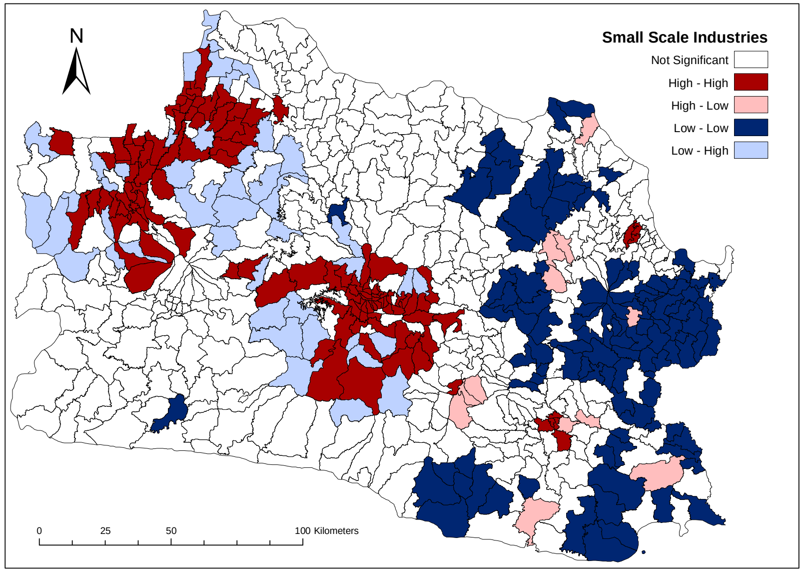


Figure 22. Small Scale Industries Cluster Map

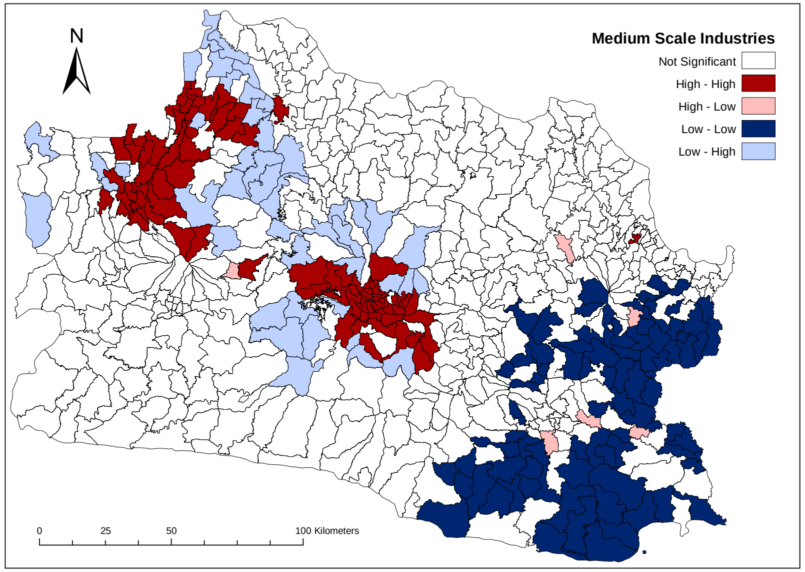


Figure 23. Medium Scale Industries Cluster Map

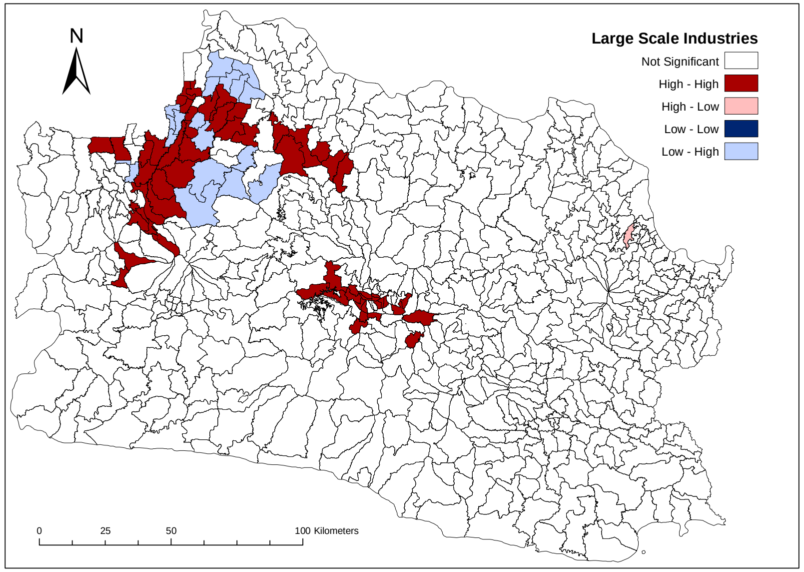


Figure 24. Large Scale Industries Cluster Map