Does Geographic Factors Determine Local Economic Development?

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Abstract - *The purpose of this paper is to analyze the influence of geographic characteristics on the local economic development. There are two important reasons related to that objective. First, study on this topic in the case of Indonesia is rather limited, especially in the field of local economic development of the country. Second, geographically, Indonesia is a heterogeneous country and its consequence is development policy should also consider the geographic characteristics of the country. The study estimates impact of some geographic variables on the Gross Domestic Regional Product (GDRP) per capita and GDRP density as indicators of local economic development with data of the districts in the Central Java province uses regression models. Geographic variables used in the model are distance to economic centres, location of districts, and a measure of clustering of economic activity. Other socio-economic variable is also used in the model, such as literacy rate which is one of the components of human development index (HDI). This study found that in general geography influences local economic performance; however, geography is not the only determinant of economic performance. It also suggests that study on geographic inequality not only apply "per capita approach" but also "density approach" to get a more comprehensive picture of the impact of geography on economic development.*

Key words: *geographic, local economic development, Indonesia*

1. INTRODUCTION

Spatially, Indonesia is a diverse nation not only in its location of economic activity but also in other aspects such as resource endowments, population settlement, ecology and ethnicity (Hill, Resodarmo, and Viddyatama 2009). Java is the location of most of economic activity in Indonesia. This island is also more developed than the rest of the country. However, recent report by a national newspaper based on its expedition along the South Coast of Java (locally known as Pantai Selatan or Pansela) describes that this area is an irony. This report concludes that although these regions have rich natural endowments they are still poor and lagged regions in Java (*Kompas* 26/4/2009).[1] In other word,

[1] *Kompas* daily conducted *Ekspedisi Susur Selatan Jawa* 2009 in two weeks (26 April – 5 May 2009) from Banyuwangi in East Java to Ujung Kulon in Banten. The aim of this expedition is to support development in the Southern regions of Java.

economic activity on this island is concentrated at the North of Java, mainly at the North Coast or known as Pantai Utara (Pantura).

The report rises an important question: does location or other geographic factors significantly influence economic development? It is also an interesting topic in recent studies on economic growth. According to Gallup, Sachs, and Mellinger (1999) and Nordhaus (2006), modern world macroeconomics and growth economics until 1990s generally ignored geographic factors, although its role has long been noted. Then, it is not surprising if study on this topic in the case of Indonesia is also rather limited, especially in the field of local economic development of the country.

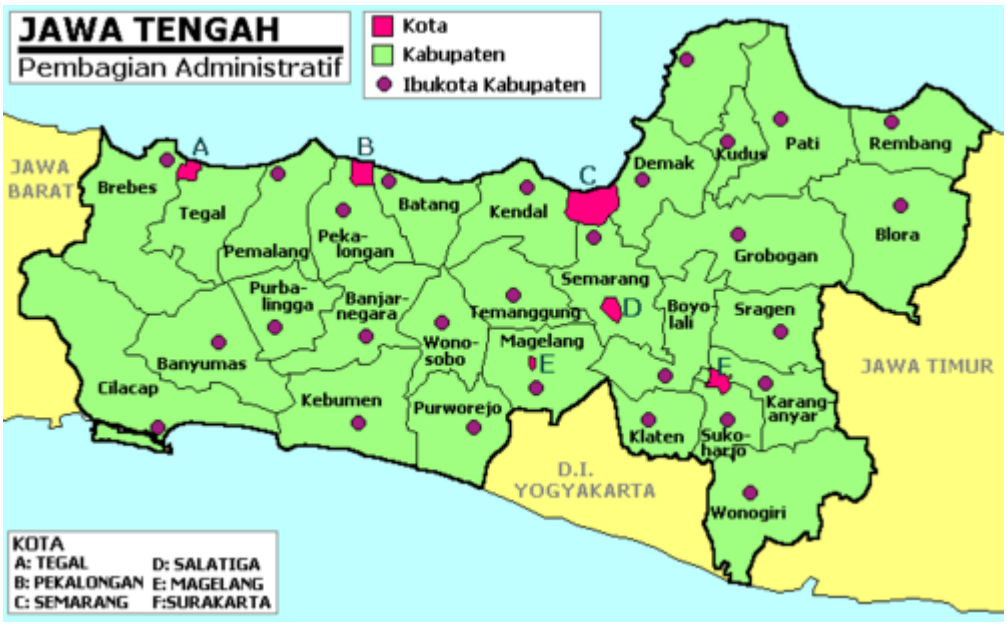
There are some studies that have put their concern on the geographical issues in Indonesia. Hill, Resodarmo, and Viddyatama (2009) provide a brief review of the role of geography in Indonesia as they found that the "connection" to the global economy is an important factor of the better performing regions, in which global connection refers to the sense of location, infrastructure and trade regime. Meanwhile, Grimm and Klasen (2008) show that geography through its effects on migration and institution is a valid instrument to establish the causal links between institutions and technology adoption as well as technology and economic growth in the case of villages in the Lore Lindu regions, Central Sulawesi. They use the share of agricultural land which is on steep slopes, the years of the last drought and whether the village was accessible by car as a measure of geographical remoteness and geographic traits. Amiti and Cameron (2004) concern the relation between geography and wages using firm level data across kabupaten, excluding some provinces in the Eastern Indonesia region. Geographic variables used in their estimation of Java's districts are such as dummy variable for coastal districts and the distance to the closest major port to capture location specific effects. Their findings indicate that geographical location is one of determinants of firms' wages. For example, they say that only the firms that are not located in the periphery get benefit from vertical linkages.

In the case of underdevelopment of the South Coast of Java, the *Kompas*' expedition claims it is closely related to infrastructures that may determine the accessibility of their inhabitants. It indicates that development of infrastructure is one of important keys in providing good opportunity for lagging regions to achieve better economic performance. In general, it means that a better policy is important to change geographic disadvantages to become an economic opportunity (Redding and Venables 2004). Moreover, following Nordhaus (2006), in order to understand why there is a geographic inequality between both

areas, we have to separate "region effects" from "geographic effects". Nordhaus explains "region effects" is such as economic policies, while "geographic effects" are such as climate or distance from markets.

Based on this background, the main purpose of this article is to exercise the influence of geographic characteristics on the local economic development by employing the Central Java province as an example (Figure 1). Perhaps, this work gives an early picture of the relation between geography and local economic development in Indonesia, especially in Java. Section 2 provides a brief review on the previous studies and followed by a section of model specification and data. Estimation results are discussed in section 4. The last section is a summary of this study.

Figure 1. Map of Central Java[2]



2. THE ROLE OF GEOGRAPHY: A SHORT REVIEW

Nordhaus (2006) said the linkage between economic activity and geography is obvious as populations cluster mainly on coasts and rarely on ice sheets. However, although the role of geography has long been noted, it is generally ignored in the economic studies, especially in modern macroeconomics and growth economics until 1990s, (Gallup, Sachs, and Mellinger 1999, Nordhaus 2006). Why do economists ignore geography in their

[2] http://e-semarang.com/wp-content/uploads/2009/03/500px-peta_administratif_jawa_tengah.png

empirical studies? Nordhaus presents three factors that have prevented a thorough integration of geographic factors into macroeconomic analysis. First, economic growth theory has paid most attention on endogenous and policy factor rather than exogenous factors such as geography or "unchanging" factors. Second, although studies of the impact of geography on economic activity have emphasized the level or growth in per capita output, it is difficult to capture time-invariant geographic factors in such studies. Third, most measures of economic activity have been time series or panel-measured at the level of the country at enormously different geographic scales or only at low precision.

According to Nordhous (2006), Hall and Jones and Sach from Harvard University and his colleagues in 1990s were the pioneers who have introduced geography into studies of economic growth and development. Hall and Jones (1999) found that geography (measured as distance from the equator) was among the most significant variables behind differences in per capita output across the nations. For Hall and Jones, location affects economic success because of pattern of human settlements, which influence institutions. Their work has actually been dedicated to find reasoning for the enormous diversity of per capita income across the nations with a working hypothesis that income diversities are mainly determined by institutions and government policies.

In a study that investigated the ways in which geography may matter directly for macroeconomic growth, Gallup, Sachs and Mellinger (1998) said they believe that along with economic and political institutions, geography continues to matter importantly for economic development. It is based on their findings that location and climate have large effects on income levels and income growth such as through their effects on transport costs, disease burdens, and agricultural productivity. They also believe that geographical considerations should be reintroduced into economic and theoretical studies of cross-country economic growth. In the empirical study, they used geographic factors such as distance to coastline and the percentage of land area in the tropics as determinants of economic growth.

Other paper by Bloom and Sachs (1998) that focused on African economic growth found that various aspects of tropical geography, demography, and public health are vitally important to economic growth. They also argued that two-thirds of the weight of Africa's growth shortfall to the "non-economic" conditions, and only one-third to economic policy and institution. Mellinger, Sachs and Gallup (1999) examine the geographic distribution of per capita GDP, GDP density (defined as GDP per km^2), and population density that are

highly influenced by climate and proximity to the sea. They found the ecological tropics, the dry regions, and sub-tropical regions are systematically poorer than temperate eco-zones. Meanwhile, in the case of China under market reforms, Shoming Bao, Hsin Chang, Sachs and Wing Thye Woo (2002) found that geographic factors are statistically significant in explaining the regional disparity in China, mainly between coast and non-coast. The returns to the capital investment in the coastal provinces of China that have the spatial and topographic advantages are higher than in the rest of the country. This high return of investment then attracted more foreign direct investment and migrant labour into the region and caused the growth disparity between the coastal and non-coastal provinces.

Blum and Cayeros (2002) tried to reassess the importance of geographic factor on the economic development as pioneered by Gallup, Sachs and Mellinger (1999) in the case of Mexican states. In testing some hypotheses for the correlation of geography and development in Mexico, they found that the role of geography is limited; however, a fair amount of regional inequality in Mexico is attributable to natural conditions and the social and political environment that reinforces such natural conditions. In general, they argue that geography affects development mainly through political channel.

In their recent article, Redding and Venables (2004) argue that per capita income may be affected by geographical location through its influence on flows of good, factors of production, and ideas. They use some geographical variables in their estimation such as bilateral distance, arable land area, and location of a country to the sea. They found that the effects of economic geography are highly statistically significant and quantitatively important. In other word, economic geography matters for per capita income.

The above studies have described the influences of geography on the development. These are also known as a geo-climatic determinism on economic performances. However, other studies argue that although geography is important, it is not the only determinant of economic development (Henderson, Shalizi and Venables 2001, Hernández-Catá 2000, Nordhaus 2006, World Bank 2009). They provide arguments to refuse or to minimize pessimism in the geo-climatic determinism.

In their review article, Henderson, Shalizi and Venables (2001) conclude that geography matters for development; however, they argue that economic growth is not governed by geographical determinism. They found that distance matters which impacts trade, investment and income. These impacts indicate the cost of being outside existing centres. However, as they argued, cost of remoteness can be reduced and new economic

centres can develop. Policy that facilitates trade and investment flow and bring country into the world trading system can reduce the cost of remoteness. They also recall that other efforts such as infrastructure improvements are important to accompany trade policies such as tariff liberalization.

Hernández-Catá (2000) said Bloom and Sachs' finding is not very convincing. He disagreed with Bloom and Sachs since other countries in the tropics Asia, states in hot climate in United States, and landlocked countries such as Swiss and Czech, even Botswana in Sub Sahara Africa could achieve economic growth. According to Hernández-Catá, the importance of geo-climatic factors have been overestimated while the crucial important of policy have been underestimated. It should be noted that in their conclusion, Bloom and Sachs (1998) have intended that they do not mean that economic policy is unimportant.

Moreover, Nordhaus (2006), based on his estimation on the influence of geographic variables such as mean annual temperature, mean annual precipitation, soil categories, and distance from coastline, concludes that geography is important, but much variability remains. It indicates that geography is not the only determinant of economic performance. Based on analysis on Africa, Nordhaus argues that other factors appear to contribute more than geography to poor economic performance of Africa. In his study, Nordhaus states geographical factors as physical attributes that are tied to specific locations. There are two groups of these attributes: non stochastic and stochastic on the relevant time scale. Non stochastic attributes are such as latitude, distance or elevation, while stochastic attributes with slowly moving means and variability are such as climate and soils. In his study, Nordhaus remedied the previous research by employing almost 20,000 terrestrial observations and concerned with the geographic intensity of economic activity rather than the personal intensity of economic activity. The Nordhaus' approach is Gross Cell Product (GCP) that resembles the concept of GDP density proposed by Mellinger, Sachs and Gallup (1999). In the GCP, the "cell" is the surface bounded by 1-degree latitude by 1-degree longitude contours, meanwhile, GDP density is intensity of economic activity per km^2.

The latest *World Development Report* claims that location is an important determinant of and quality of life as it stated that "The best predictor of income in the world today is not *what* or *whom* you know, but *where* you work." However, although location remains important at all stages of development, the report said that it matters less for the rich countries than the poor or developing countries (World Bank 2009: 2). According this

report, there are three development attributes that have not always received much attention. These attributes are geographic unevenness, circular causation, and neighbourhood effect. Geographic unevenness implies that government generally cannot simultaneously foster economic production and spread it out smoothly. Circular causation provides hope for policy makers wishing to pursue progressive objectives because rising concentrations of economic production are compatible with geographic convergence in living standards. The neighbourhood effect means that promotion of economic integration is important to address difficulties of lagging regions from its unevenness and circularity.

To answer a question why some places are doing well than others, the *World Development Report* is based on three spatial dimensions: density, distance, and division (p. 37). As Nordhaus (2006) and Mellinger, Sachs and Gallup (1999), density indicates the size of economic output or total purchasing power per unit of surface area. Distance measures the ease of reaching market that determines access to opportunity. And, division arise from barriers to economic interactions created by differences in currencies, customs, and languages, which restrict market access. At geographical scales, density, distance, and division are the most important dimensions at local, national, and international context respectively. Then, some places better than other is argued because those places have promoted transformations along the three dimensions of economic geography: higher density, shorter distances and fewer divisions. The main message of this report is that economic growth will be unbalanced but development can still be inclusive through economic integration.

3. DATA AND MODEL SPECIFICATION

Data used in this study are mainly collected from *Propinsi Jawa Tengah dalam Angka* produced by the BPS Central Java. It is a case of Central Java in 2005. Since its observation quite limited, then this study only provides an early picture of influences of geography factors on the local economic performance rather than giving a longitudinal analysis.

Local economic development in this study is measured by two dependent variables used in linear regression. The first variable is Gross Domestic Regional Product (GDRP) non oil per capita (**LogYC**) that is commonly used in regional studies in Indonesia. The second variable is based on GDRP non oil per km^2 (**LogYD**) as a measure of economic density that is introduced by Mellinger, Sachs and Gallup (1999). Both variables are in

constant price. Table 1 provides LogYC and LogYD of 35 regions in Central Java province in 2005.

Table 1. LogYC and LogYD in Central Java province by regions, 2005

Name of Kabupaten/Kota	LogYC	Rank	LogYD	Rank
01. Cilacap (SC)	6,80	6	9,68	11
02. Banyumas (IN)	6,38	28	9,43	21
03. Purbalingga (IN)	6,37	29	9,39	24
04. Banjarnegara (IN)	6,43	24	9,33	29
05. Kebumen (SC)	6,30	34	9,27	30
06. Purworejo (SC)	6,51	16	9,35	28
07. Wonosobo (IN)	6,32	30	9,20	32
08. Magelang (IN)	6,45	22	9,48	18
09. Boyolali (IN)	6,57	13	9,53	14
10. Klaten (IN)	6,57	14	9,80	9
11. Sukoharjo (IN)	6,69	9	9,93	8
12. Wonogiri (SC)	6,39	25	9,12	33
13. Karanganyar (IN)	6,72	7	9,73	10
14. Sragen (IN)	6,43	23	9,39	25
15. Grobogan (IN)	6,29	35	9,12	34
16. Blora (IN)	6,31	32	8,97	35
17. Rembang (NC)	6,51	17	9,26	31
18. Pati (NC)	6,49	19	9,38	26
19. Kudus (IN)	7,15	1	10,40	6
20. Jepara (NC)	6,51	15	9,53	15
21. Demak (NC)	6,39	27	9,44	19
22. Semarang (IN)	6,71	8	9,68	12
23. Temanggung (IN)	6,46	21	9,36	27
24. Kendal (NC)	6,67	10	9,63	13
25. Batang (NC)	6,47	20	9,40	23
26. Pekalongan (NC)	6,50	18	9,49	17
27. Pemalang (NC)	6,32	31	9,44	20
28. Tegal (NC)	6,30	33	9,50	16
29. Brebes (NC)	6,39	26	9,42	22
71. Kota Magelang (IN)	6,84	4	10,69	2
72. Kota Surakarta (IN)	6,88	3	10,94	1
73. Kota Salatiga (IN)	6,60	12	10,10	7
74. Kota Semarang (NC)	7,05	2	10,64	3
75. Kota Pekalongan (NC)	6,80	5	10,58	4
76. Kota Tegal (NC)	6,62	11	10,46	5
SC Average	6,50		9,35	
NC Average	6,54		9,71	
IN Average	6,56		9,67	

Note: SC = South Coast or Pansela region, NC = North Coast or Pantura region, IN = Inland region

The table shows there is no large difference between the South Coast, the North Coast and the Inland regions in GDRP non oil per capita. However, based on GDRP non oil per km^2, the North Coast regions have better performance than the South Coast regions. This picture gives an empirical reason to employ not only GDRP per capita but also GDRP

density as indicators of economic development in empirical study on the geographic inequality.

Kabupaten Kudus (District of Kudus), Kota Semarang (Town of Semarang) and Kota Surakarta (Town of Surakarta) are the three best performing regions in this province based on output per capita. Kabupaten Kudus and Kota Semarang are located in North Java, while Kota Surakarta is at inland area. There is a small shift in the best of three regions if we use GDRP density. Kota Semarang and Kota Surakarta are still in this group; however, their rank have changed from the 2nd to 3rd and from 3rd to 1st, while at the second rank is Kota Magelang. Kota Magelang is the smallest region in Central Java in term of its land area. The area of this region is only 18,12 km^2 or less than a half of area of Kota Surakarta which is the second smallest region in this province. It indicates that employing density of economic activity may give different picture of geographical inequality. Moreover, the table shows that only one region, Kabupaten Jepara, have the same rank in both indicators of economic development. It also brings a consequence when we look for where the centres of economic activity in Central Java are. Based on GDRP per capita, the centres are Kabupaten Kudus, Kota Semarang and Kota Surakarta. But, based on GDRP per km^2, the centres are Kota Surakarta, Kota Magelang, and Kota Semarang.

Based on discussions in previous section, there are four blocks of explanatory variables of local economic development used in this study: geography or spatial, infrastructure, human capital, financial capital, and government support. Since there are two indicators of economic development, then there are also two models for both indicators. Both models in general have a similar specification; however, the definitions of several variables of the models are different. The first economic indicator refers to per capita and the other one refers to per km^2 or as density variables. Equation 1 and 2 are for GDRP per capita and GDRP per km^2, respectively.

(**Eg. 1**) $LogYC = \alpha_0 + \alpha_1 LogDYC + \alpha_2 DNC + \alpha_3 LogYClust + \alpha_4 DP + \alpha_5 DA + \alpha_6 Lit + \alpha_7 LogCC + \alpha_8 LogDC + e$

(**Eg. 2**) $LogYD = \beta_0 + \beta_1 LogDYD + \beta_2 DNC + \beta_3 LogYClust + \beta_4 DP + \beta_5 DA + \beta_6 Lit + \beta_7 LogCD + \beta_8 LogDD + f$

LogDYC, LogDYD, DNC, and LogYClust are geography or spatial variables. DP and DA are dummy variables represents physical infrastructures. Lit is a human capital indicator. LogCC and LogCD are variables that represent ability of accessibility of financial capital, and LogDC and LogDD are variables for local government support.

Distance (LogDYC and LogDYD) are expected to have negative influence on the local economic performance (LogYC and LogYD). Meanwhile, DNC and LogYClust are predicted to have positive impact on the dependent variables. Dummies of infrastructures (DP and DA) and the rest of independent variables are expected to give positive signs.

LogYC is the log of GDRP non oil per capita in constant price and **LogYD** is the log of GDRP non oil per km^2 in constant price. **LogDYC** is the log of kilometre of distance from a given region to the closest economic centres based on GDRP per capita within the province. Based on this indicator, as shown in Table 1, the three biggest economic centres in Central Java are Kabupaten Kudus, Kota Semarang, and Kota Surakarta. For instance, since the distance from the capital city of Kabupaten Cilacap to the capital city of Kabupaten Kudus is 302 km, to Kota Semarang (282 km) and to Kota Surakarta (264 km), then distance used for Cilacap is 264 km. It should be noted that distances of Kabupaten Magelang, Kabupaten Pekalongan, and Kabupaten Tegal are measured by distance from Kota Magelang, Kota Pekalongan, and Kota Tegal to the closest economic centre, respectively. This proxy is employed because the BPS statistics (in *Jawa Tengah Dalam Angka*) does not provide distance of those three districts. This approach is inspired by Gallup, Sachs, and Mellinger (1999) that in their cross country estimation they use the minimum log-distance of the country to one of the three core regions in the United Stated (New York), Western Europe (Amsterdam), or Japan (Tokyo). Meanwhile, **LogDYD** is the log of kilometre of distance from a given region to the closest economic centres based on GDRP per km^2 within the province. Based on this indicator, as shown in Table 1, the three biggest economic centres in Central Java are Kota Surakarta, Kota Magelang, and Kota Semarang. As in LogDYC, distances of Kabupaten Magelang, Kabupaten Pekalongan, and Kabupaten Tegal are measured by distance from Kota Magelang, Kota Pekalongan, and Kota Tegal to the closest economic centre, respectively.

DNC is a dummy variable that takes a value of 1 for all regions located at the North Coast of Central Java. **LogYClust** is a proxy of a spatial cluster of neighbourhood effect of the surrounding regions of a given region. It is measured by the log of sum of GDRP non oil in constant price of the surrounding regions. **LogYDC** is a proxy of a spatial cluster of neighbourhood effect of the surrounding regions of a given region. It is measured by the log of GDRP non oil per km^2 in constant price of the surrounding regions. Lall and Chakravorty (2006) in their study on the spatial concentration of Indian industry use "spatial lag". They argue that this variable corrects spatial autocorrelation in spatial

regression models and at the same time it is also a measure of spatial clustering.

DP is a dummy variable of port facility that takes a value of 1 for all regions with port facility. There are five regions that have port: Kabupaten Cilacap (Tanjung Intan), Kabupaten Pati (Juwana), Kabupaten Jepara (Jepara), Kota Semarang (Tanjung Mas), and Kota Tegal (Tegal). **DA** is a dummy variable of airport facility that takes a value of 1 for all regions with airport facility. Regions with airport are Kabupaten Cilacap (Tunggul Wulung), Kota Semarang (Achmad Yani), Kota Surakarta and Kabupaten Boyolali share Adi Sumarno airport.[3] Alternative measures of these variables are distance of the region to the closest port or airport, as employed for LogDYC and LogDYD in geographical meaning. Amiti and Cameron (2004) use distance to the closest port in their estimations. However, *Jawa Tengah Dalam Angka* does not provide this data in detail. Therefore, this study uses dummy variable of port and airport that rather represents availability of transportation infrastructures to connect to other geographic locations of economic centres outside the province.

Table 2. Summary statistics of dependent and independent variables

Variable	Mean	Std. dev.	N	%
LogYC	6,55	0,22		
LogYD	9,66	0,50		
LogDYC	1,83	0,35		
LogDYD	1,80	0,32		
DNC			13	37
LogYClust	13,10	0,26		
DP			5	14
DA			4	11
Lit	87,87	5,10		
LogCC	4,08	1,66		
LogCD	7,20	1,80		
LogDC	5,40	0,25		
LogDD	8,52	0,50		

Note: Number of observations = 35 regions.

Lit is adult literacy rate (%). **LogCC** is log of commercial bank outstanding credits (in rupiah and foreign exchange) per capita while **LogCD** is log of commercial bank outstanding credits (in rupiah and foreign exchange) per km^2. **LogDC** is log of actual local

[3] Adi Sumarno Airport is commonly known as the airport of Kota Surakarta. However, administratively this airport is located in Kabupaten Boyolali (http://id.wikipedia.org/wiki/Kabupaten_Boyolali). Since both regions share benefit of this airport, then these regions are classified as regions with airport facility.

government development expenditure per capita and **LogDD** is log of actual local government development expenditure per km^2.

Descriptive statistics of dependent and independents variables are presented in Table 2. Estimation of equations uses the Ordinary Least Square (OLS) procedure. It should be noted that each equation is estimated in two versions based on number of observations. In version A, estimation includes all regions, while in version B there are three regions that are excluded from observations. These three regions are regions with high rank in the whole regions. For Equation 1, based on GDRP per capita, the regions are Kabupaten Kudus, Kota Semarang, and Kota Surakarta, and for Equation 2, while based on GDRP density, they are Kota Magelang, Kota Surakarta, and Kota Semarang.

4. THE FINDINGS AND DISCUSSIONS

The explanatory power of model 1A and 1B in Table 3 are quite strong. Both models can explain about 60 percent variation of LogYC. There is no multicolliniearity problem in these estimations since the coefficients of correlation among the independent variables are less than 0.8. It follows Gujarati and Porter (2009: 338) which says that multicollinearity exists when correlation coefficient between independent variable is greater than 0.8. Tables of correlation coefficients based on 35 observations are presented in the Appendixes.

Table 3. Regression results (dependent variable: LogYC)

Variable	1A		1B	
	Coefficient	t	Coefficient	t
(Constant)	9,936*	5,607	7,893*	5,923
LogDYC	-0,224*	-2,891	-0,215*	-3,793
DNC	0,035	0,622	0,058	1,373
LogYClust	-0,307*	-3,026	-0,234*	-3,114
DP	-0,012	-0,145	-0,01	-0,164
DA	0,238**	2,594	0,277*	3,247
Lit	0,012**	2,358	0,014*	3,462
LogCC	0,046**	2,615	0,032**	2,311
LogDC	-0,052	-0,488	0,134	1,573
Adj.R2	0,586		0,612	
F	7,006		7,102	
N of Obs.	35		32	

Notes: *) indicates significance at 1% level, **) at 5% level, ***) at 10% level. Kabupaten Kudus, Kota Semarang, and Kota Surakarta are excluded from the data set in the Model B.

There are five variables that significantly influence log of GDRP per capita. Two geographical variables (LogDYC and LogYClust) have significant impact on LogYC. This variable is LogDYC which means that distance matters in local economic development. Far from the economic centres is disadvantageous for the regions in their local development because they lose their opportunity to access the core markets. This finding is consistent with previous studies as have been discussed in Section 2. In the models, dummy of the North Coast regions (DNC) is insignificant although their signs are as expected by theory. [4] Thirteen regions in the North Coast (Pantura) with 32 percent of Central Java's inhabitants contribute 40 percent of GDRP of Central Java, while for the South Coast (Pansela) regions contribute 14 percent and 12 percent of Central Java's output and population, respectively. As already shown in Table 1, there is no large difference between the North and the South coast in terms of GDRP per capita.

Meanwhile, variables of the spatial clustering (LogYClust) have negative impact on the LogYC in both estimations.[5] These results are opposite to expectation. It could be interpreted that high economic performance of surrounding regions gives a negative spillover to a given region which they surround, because there is an outflow of economic resources from the poor regions to their neighbours that have better economic performance. This finding probably implies that there is a lack of what may be called as "the cross-regions development policies" to exploit the benefit of economic activity clustering. It is probably also related to recent development of decentralization in Indonesia which regions tend to compete with each other, rather than to cooperate in developing their economy. Then, the result is the region tends to try to exploit the benefit of economic centres at the province. However, as it is indicated by LogDYC, the opportunity to get benefit from the centres will be smaller with the increase of distance.

Infrastructure variable that significantly influences LogYC is dummy variable of airport facilities. It means that GDRP per capita of regions with airport facility tend to be higher than the rests. Availability of airport facility makes the regions more connected to the global economy then they are able to get higher economic performance. Two of the three best regions in term of GDRP per capita (LogYC in Table 1) are those that have airport facility. Adult literacy rate (Lit) shows positive influence on LogYC. It implies that

[4] Dummy variable of the coastal regions (DC) have been experimented, but this variable have high correlation (more than 0,70) with DNC then this study chooses to drop DC in the estimations but keep DNC.

[5] It should be noted that estimations use spatial clustering variable that also include regions in other provinces (West Java, DI Yogyakarta, and East Java) have been experimented and give significant results and its impacts are rather higher than the first version of the spatial clustering measure.

human capital is important in determining local economic development. Commercial credit accessibility as expected also determines local development as shown by significant impact of LogCC.

Comparing model 1A and 1B give a conclusion that generally there is a consistency of the regression coefficients of all variables, except variable LogDC as indicator of local government support. It means that exclusion to the three economic centres in this province based on GDRP per capita (Kabupaten Kudus, Kota Semarang, and Kota Surakarta) does not change the result drastically.

Table 4. Regression results (dependent variable: LogYD)

Variable	2A		2B	
	Coefficient	t	Coefficient	t
(Constant)	8,573*	3,417	8,715*	3,288
LogDYD	-0,279**	-2,3	-0,284**	-2,192
DNC	0,183**	2,237	0,194**	2,149
LogYClust	-0,407**	-2,642	-0,382**	-2,319
DP	-0,006	-0,055	0,019	0,15
DA	0,140	1,132	0,115	0,698
Lit	0,025*	3,313	0,024*	2,963
LogCD	0,099*	4,389	0,097*	3,936
LogDD	0,458*	5,217	0,415*	4,089
Adj.R2	0,848		0,715	
F	24,708		10,715	
N of Obs.	35		32	

Notes: *) indicates significance at 1% level, **) at 5% level, ***) at 10% level. Kota Magelang, Kota Semarang, and Kota Surakarta are excluded from the data set in the Model B.

What happens if estimation is using density approach rather than per capita approach? Table 4 shows estimation results using density approach have better explanatory power on the variation of local economic development indicator. R-square (adjusted) of the estimations is more than 0.70 that means the models are able to explain more than 70 percent of variation of local economic density. Perhaps, this finding means that using density approach may give a better empirical power than using conventional approach (per personal intensity capita) in measuring local economic activity. In contrast to population that change over time, area could be classified as unchanging variable in measuring the economic intensity of a region.

Variable of distance, spatial cluster, literacy rate, and access to commercial credit show similar sign and also significance as in the Model 1A and 2A. The magnitude of their impacts on the LogYD is also larger than on the LogYC. However, dummy variable of

airport facility lose its significance, while government development expenditure and dummy variable of Northern regions become significant. Positive and significant impact of DNC confirms regions in the Northern area which have better economic performance than the rests of Central Java as have been indicated by the *Kompas* expedition in coastal regions at Southern of Java. Using density approach in the estimations also gives coefficient of LogDD as is expected. It means that local government support is important to increase economic performance of the regions. The coefficient of LogDD which is higher than others imply that local development expenditure may play significant role in reducing the geographical equality. However, regions have to work together with their neighbours to exploit the benefit of economic clustering.

Generally, the estimation results show that the influence of geography factors on the economic density is larger than on the personal intensity of local economy. It also implies that different measure of economic intensity may give different magnitude of impact of geography on economic performance. However, it should be mentioned that the results confirm that local economic performance is not only determined by geographical factor but also other factors such as financial access, human capital, and local government policy. In other words, the findings suggest that geography matters in local economic development, but it is not the only determinant.

CONCLUSION

The paper analyzes the influence of geography on local economic performance. This observation is quite limited since it only employs data of Central Java province in 2005. Therefore, this study does not provide a longitudinal analysis on the relation between geography and local economic development. By considering this weakness, perhaps this work gives an early picture on the influence of geography on local economic development in Indonesia, especially in Java.

There are four important conclusions of this study. First, there is no large difference between the South Coast, the North Coast and the Inland regions of Central Java province in GDRP non oil per capita. However, based on GDRP non oil per km^2, the North Coast regions have better performance than the South Coast regions. Second, based on the empirical estimations, generally the study confirms the influences of geography on local economic performance. Located far from the economic centres is disadvantageous for regions, as well as if they are not located in the North Coast. Third, the findings also show that the influence of geography factors on the economic density is larger than on the

personal intensity of local economy. It also implies that different measure of economic intensity may give different magnitude of impact of geography on economic performance. Fourth, it should be mentioned that the results confirm that local economic performance is not only determined by geography but also other factors such as financial access, human capital, and local government policy. In other words, it suggests that geography matters in local economic development, but it is not the only determinant of economic performance.*******

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Appendix

Correlation matrix (Pearson correlations)

	1	2	3	4	5	6	7	8	9	10	11	12	13
LogYC	1,00												
LogYD	0,84	1,00											
LogDYC	-0,22	-0,03	1,00										
LogDYD	-0,19	0,01	0,79	1,00									
DNC	-0,03	0,07	0,02	0,36	1,00								
LogYClust	-0,30	-0,44	-0,19	-0,19	0,02	1,00							
DP	0,28	0,23	-0,03	0,28	0,36	-0,01	1,00						
DA	0,47	0,39	0,18	0,11	-0,09	-0,03	0,37	1,00					
Lit	0,44	0,59	0,27	0,20	0,00	-0,16	0,14	0,25	1,00				
LogCC	0,58	0,48	-0,20	-0,09	-0,17	0,10	0,24	0,34	0,28	1,00			
LogDC	0,11	0,34	-0,01	-0,01	-0,09	-0,35	0,04	0,23	-0,01	-0,10	1,00		
LogCD	0,65	0,62	-0,17	-0,06	-0,13	0,01	0,25	0,36	0,37	0,98	-0,01	1,00	
LogDD	0,45	0,80	0,06	0,09	0,04	-0,48	0,13	0,30	0,40	0,18	0,79	0,33	1,00

No. of Obs. = 35