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Analysis of Economic Growth Core and Periphery: Evidence from Aceh Province, Indonesia

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Abstract

This research is to determine factors that influenced Gross Regional Development Product (GRDP) Banda Aceh and Lhokseumawe city in context relationship between core and periphery using panel data regression of 23 districts/cities in Aceh Province, Indonesia year 2010-2020. Selected independent variables in this paper are GRDP core and periphery, population, distance between core and periphery, availability of hospital, availability of university and availability of industry. Based on estimation results, all independent variabels have significant effect toward GRDP Banda Aceh and Lhokseumawe city. Variabels that found have positive effect toward GRDP Banda Aceh city are GRDP core and periphery, and distance between core and periphery. Variabels that found have negative effect toward GRDP core Banda Aceh city are population, availability of hospital, availability of university and availability of industry. Then, variabels that found have positive effect toward GRDP Lhokseumawe city are GRDP core and periphery, distance between core and periphery, and availability of university. Variabels that found have negative effect toward GRDP core Lhokseumawe city are population, availability of hospital, and availability of industry. It is hoped that this findings will provide useful information for policymakers in attempt to enhance the competitiveness of regional economy.

Keywords: GRDP, Core and Periphery, Panel Data Regression.

1. Introduction

Regional economic growth is an increase in people's income marked by the added value in the area (Fijay et al., 2021). The increase in revenue is measured in absolute value, namely in fixed prices (Mulrsalina et al, 2022). It also explains the remuneration of production factors operating in the area. Regional prosperity is determined not only by added value but also by the size of the transfer payment, which is the share of income that leaves or enters the region (Zulfikar et al., 2021).

Regional development, in essence, in addition to emphasizing development in each region, also prioritizes increasing interaction between areas to achieve a higher level of welfare and reduce the level of inequality and inequality between regions (Hasyyati and Sahara, 2020). Likewise, city growth can be seen in the size of the city, which is the primary determinant of city growth (Wijayanti et al, 2021). Usually, big cities grow faster than small cities (Yusuf et al., 2021). The economic savings resulting from the concentration of agglomeration activities in big cities have been widely felt. However, when agglomeration symptoms are excessive and exceed the level considered sufficient, economic waste occurs, such as symptoms indicating that wages are increasing, production costs are increasing, and the price of goods is also increasing (Fattah and Rahman, 2013).

The central system of activities includes government office services, trade and industrial and warehousing services, social and cultural activities, and nodes for mass public movement. The system consists of a primary activity center, secondary activity center, tertiary activity center, quaternary, and quieter activity center. This study will discuss the areas included in the primary activity center, secondary activity center, and tertiary activity center, which will be connected to determine the location of the Core and Hinterland Regions in Aceh Province. Article 15 paragraph 3 explains that the primary activity center, as referred to in paragraph (2) letter a, is a National Activity Centre (PKN) as an urban area that serves Aceh, national and international scale activities including Banda Aceh, Sabang, and Lhokseumawe. The secondary activity center described in paragraph 4 is an urban area District Activity Centre

(PKW) that serves several districts/cities in Aceh, including Langsa, Bireuen, Meulaboh, Blang Pidie, and Subussalam. Paragraph 5 explains that the tertiary activity center, which is a street vendor as an urban area that functions to serve district/city scale activities, includes: Jantho, Sigli, Meureudu, Lhoksukon, Kuala Simpang, Idi Rayeuk, Calang, Suka Makmur, Tapaktuan, Redelong, Kutacane, Blangkejeren, Singkil, and Sinabang. Based on this Qanun, three areas are categorized as economic activity centers: Banda Aceh City, Sabang City, and Lhokseumawe City. Still, only two areas were selected in this study, namely Banda Aceh City and Lhokseumawe City. The periphery area was then all other 21 districts/cities in Aceh Province.

Studies about this issue have been conducted alot, some of them such as study by Kustanto (2020), Rizal and Nuruhwati (2019), Budiyantini and Pratiwi (2016) in Indonesia. Lin and Ling (2021), Baum-Snow et al. (2020), Bai et al. (2012) in China. Muliadi et al. (2017) in Aceh Province, Indonesia. Also study by Sharma and Chandrashekar (2014) in India and Ray et al. (2012) in Canada.

The development and growth of the city do not stand alone. Still, they are always related to the surrounding area, related to the hinterland, because cities with a high growth rate must attract productive factors from outside. Cities must attract investors or investors, attract managerial experts, attract migrants, and innovate from outside. Cities become a relatively strong attraction for residents outside the city, both in rural areas and those in smaller cities. The city's attractiveness is frequently considered to be highly influential because the city's capacity is growing rapidly. As a result, both perception and reality indicate that a larger city has higher job availability, higher income, a higher standard of living, more comprehensive entertainment and entertainment facilities, and higher quality education and health facilities than rural areas and smaller cities.

Based on explanation above, this paper attempts to examine determinants of GRDP main city in context of relationship between core and periphery in the Aceh Province, Indonesia from 2010 to 2020. It is hoped that this study will provide helpful information for policymakers interest in enhancing the regional economy.

2. Literature Review

The term "economic development" is derived from the combination of two words, namely development and economy (Kurniawan and Managi, 2018). The development is defined as the output of construction activities. In contrast, economics is concerned with processing goods from various sectors such as industry, agriculture, and trade. Meanwhile, Yudhistira and Sofiyandi (2018) defines economic development as a long-term process aimed at increasing a population's real per capita income in a given area.

Spatial planning is a localization theory that studies geographical conditions with various potential sources and has a relationship with various types of activities or businesses carried out such as social, economic, and regional. Multiple activities are located in certain places such as households, shops, agriculture, mining, places of worship, factories, and schools placed sequentially, which describe a pattern or arrangement that is researched and studied. In studying the activity position, the economist or geographer first devises the view that the spatial structure being analyzed is flat in all directions and under the same conditions. However, in the real world, the potential and needs of each region are certainly not the same (Hudalah and Woltjer, 2007).

The relationship between the city and its periphery area can be divided into generative cities, parasitic cities, and enclaves. A generative city is a city that performs various functions both for the city itself and for its periphery where the relationship is mutually beneficial. Cities like these require raw materials, food, and labor from the interior. A parasitic city is a city that is not very able to help its periphery area and can even kill various types of activities in the area. In general, parasitic cities are cities that have not developed much in the industrial sector and are still agricultural but at the same time urban. A negative relationship occurs when a city grows but does not take input from its periphery but from outside. The city is a closed enclave as if it will be completely separated from the surrounding blood (inland areas). Weak infrastructure, high disparities, and other factors can weaken the relationship between urban and rural areas (Fattah and Rahman, 2013).

Numerous studies have been conducted on this subject, such as Bai et al. (2012), who examined the accumulation of capital and labor inputs that substantially contribute to regional economic growth in China. Then research by Baum-Snow et al. (2020) analyzes the effect of investment in constructing national highways on hinterland areas in China. Furthermore, a study by Budiyantini and Pratiwi (2016) examined the similarity of the characteristics of villages in the dominant urban area with the center of Bandung was seen as part of the sprawl phenomenon, namely urban development extending to suburban areas.

Mondal and Banerjee (2021) explore the process of peri-urbanization around the city or the transitional space that triggers changes in the suburbs and the implications of these changes on the economic conditions of suburban residents. The results observed that although these transitional spaces typically represent a spatial continuum between their urban and rural counterparts, there are some attitudes where the continuum space is discontinuous. These spaces experienced rapid population growth, while stagnant or negative growth was observed in the urban core.

Kustanto (2020) examines the role of infrastructure, human capital, and trade openness on regional economic growth in Indonesia. The results show that infrastructure, human capital, and trade openness positively and significantly impact regional economic growth, except for road infrastructure, which has a negative and insignificant effect. Rizal and Nuruhwati (2019) examined the influence of urban area growth and its relationship to Hinterland

using correlation analysis with the independent variable of economic growth in the center of urban development. The results show a positive relationship between the city and the Hinterland area.

Muliadi et al. (2017) examine the relationship between regions and the development of urban areas in the six (6) ATDC (Aceh Trade and Distribution Center) areas that have been defined in the Aceh Regional Spatial Plan (RTRW). The results showed that the most significant GI towards the center of the zone was the area; Central Zone (Banda Aceh City), North Zone (North Aceh Regency), East Zone (Langsa City), Southeast Zone (GayoLues Regency), South Zone (South Aceh) and West Zone (Nagan Raya). Random effect regression shows that the travel time and transportation costs have a significant negative effect, while distance has a negative but not significant impact. The Multi-Dimensional Stratified Analysis (MDSA) test illustrates that there are three clusters that can be developed in Aceh Province.

Sharma and Chandrashekar (2014) examined the extent to which the spatial distribution of economic activities is reflected by the quotient of location, level of urbanization, size of peri-urban areas, local unemployment rates, and rural-urban wage differentials influenced the decision to commute between workers engaged in non-farm work. The results show that districts with a concentration of secondary employment tend to be a factor in the occurrence of a two-way journey. Ray et al. (2012) used Multifactor productivity (MFP) to measure region, industry mix effects, and region interactions interpreted in a shift-share model in core and periphery regions in Canada. The results show that the difference in the area of core-periphery in the distribution of population and labor is increasing, not decreasing, and the hinterland region is far behind in labor growth compared to the core region. Lin and Ling (2021) found that regional economic integration has significantly increased land-use efficiency (ULUE) in cities and towns in the Yangtze River Delta region, China. This phenomenon shows a polarizing effect in many urban agglomerations, where developed cities absorb resources from the surrounding underdeveloped cities and limit their development.

3. Materials and Methods

3.1. Materials

This study focuses on the influence of determinant factors which are GRDP core and periphery, population core and periphery, distance between core and periphery, availability of hospital core and periphery, availability of university core and periphery and availability of industry core and periphery toward GDRP core Banda Aceh City and Lhokseumawe City. The type of data used in this paper is panel data of 23 districts/cities in Aceh Province year 2010-2020.

3.2. Methods

3.2.1. Panel Data Regression

The first regression equation for core Banda Aceh city is written as follows (Gujarati, 2004):

$$LOG\_GRDP\_BA_t = \beta_o + \beta_1 LOG\_GRDP\_CP_{it} + \beta_2 LOG\_JP\_CP_{it} + \beta_3 LOG\_JR\_CP_{it} + \beta_4 LOG\_RS\_CP_{it} + \beta_5 LOG\_UNIV\_CP_{it} + \beta_6 LOG\_IDS\_CP_{it} + \varepsilon i \quad (1)$$

Which are,
GRDP_BA = GRDP core Banda Aceh city
GRDP_CP = GRDP core and periphery
JP_CP = population core and periphery
JR_CP = distance between core and periphery
RS_CP = availability of hospital core and periphery
UNIV_CP = availability of university core and periphery
IDS_CP = availability of industry core and periphery
i = district i
t = year t
β_o = constant
$\beta_1, \beta_2, \ldots \beta_{13}$ = estimated coefficient
εi = error term

The second regression equation for core Lhokseumawe city is written as follows (Gujarati, 2004):

$$LOG\_GRDP\_LH_t = \beta_o + \beta_1 LOG\_GRDP\_CP_{it} + \beta_2 LOG\_JP\_CP_{it} + \beta_3 LOG\_JR\_CP_{it} + \beta_4 LOG\_RS\_CP_{it} + \beta_5 LOG\_UNIV\_CP_{it} + \beta_6 LOG\_IDS\_CP_{it} + \varepsilon i \quad (2)$$

Which are,
GRDP_LH = GRDP core Lhokseumawe city

GRDP_CP = GRDP core and periphery
JP_CP = population core and periphery
JR_CP = distance between core and periphery
RS_CP = availability of hospital core and periphery
UNIV_CP = availability of university core and periphery
IDS_CP = availability of industry core and periphery
i = district *i*
t = year *t*
β_o = constant
$\beta_1,\beta_2,\ldots \beta_{13}$ = estimated coefficient
εi = error term

4. Results and Discussion

4.1. Results of Panel Data Regression

4.1.1. Estimation Results of Determinants GRDP Core Banda Aceh City

The first step that must be done in panel data regression is to determine the best method that fits the regression model. Hausman test was conducted and shows probability value is 0.0000 (<0.05) indicates that between fixed effect and random effect, random effect is the best method. Furthermore, Lagrange test resulting probability value is 0.0000 (<0.05) which indicates that between common effect and random effect, random effect is still the best final method for estimating model data.

Tabel 1. Estimation Results of Panel Data Regression with Random Effect Method of Determinants GRDP Core Banda Aceh City

Variable	Coefficient	Prob.
C	4.980072	0.0000
LOG_GRDP_CP	0.454267	0.0000
LOG_JP_CP	-0.408167	0.0000
LOG_JR_CP	0.040114	0.0000
LOG_RS_CP	-0.038640	0.0000
LOG_UNIV_CP	-0.004588	0.0000
LOG_IDS_CP	-0.029937	0.0000
R-squared	0.476443	
Adjusted R-squared	0.462419	
F-statistic	33.97378	
Prob(F-statistic)	0.000000	

The estimation results in Table 1 give information that all selected independent variables have a significant effect toward dependent variable GRDP core Banda Aceh city. These variables which are GRDP core and periphery, population core and periphery, distance between core and periphery, availability of hospital core and periphery, availability of university core and periphery and availability of industry core and periphery. The simultaneous effect of independent variables also generate probability value of F-statistics is 0.000 (<0.05) which shows that the selected independent variables together have a significant effect on GRDP core Banda Aceh City. Furthermore, the value obtained of R^2 is 0.4764 which indicates that the variation of the GRDP core Banda Aceh City value explained by the independent variables is 47.64%.

4.1.2. Estimation Results of Determinants GRDP Core Lhokseumawe City

Same as estimation of determinants GRDP core Banda Aceh city, the first step that also must be done is to determine the best method that fits the model regression. The results of Hausman test shows probability value is 0.0000 (<0.05) which indicates that between fixed effect and random effect, random effect is the best method. Furthermore, Lagrange test resulting probability value is 0.0000 (>0.05) which indicates that between common effect and random effect, random effect is still the best final method for estimating model data.

Same as core Banda Aceh city, the estimation results in Table 2 also shows that all selected independent variables have a significant effect toward dependent variable GRDP core Lhokseumawe city. These variables which are GRDP core and periphery, population core and periphery, distance between core and periphery, availability of hospital core and periphery, availability of university core and periphery and availability of industry core and periphery. The simultaneous effect of independent variables also generate probability value of F-statistics is 0.000 (<0.05) which

shows that the selected independent variables together have a significant effect on GRDP core Lhokseumawe City. Also, the value obtained of R^2 is 0.2548 which indicates that the variation of the GRDP core Lhokseumawe City value explained by the independent variables is 25.48%.

Tabel 2 Estimation Results of Panel Data Regression with Random Effect Method of Determinants GRDP Core Lhokseumawe City

Variable	Coefficient	Prob.
C	9.770899	0.0000
LOG_GRDP_CP	0.226379	0.0000
LOG_JP_CP	-0.251894	0.0000
LOG_JR_CP	0.008680	0.0933
LOG_RS_CP	-0.019032	0.0036
LOG_UNIV_CP	0.012708	0.0000
LOG_IDS_CP	-0.009287	0.0003
R-squared	0.254793	
Adjusted R-squared	0.234832	
F-statistic	12.76460	
Prob(F-statistic)	0.000000	

4.2 Discussion

Variable GRDP core and periphery was found to have a positive and significant effect toward both GRDP core Banda Aceh dan Lhokseumawe city. Several previous studies are in line with this finding, such as study by Lin & Ling (2021), Kustanto (2020), Rizal & Nuruhwati (2019) that also found that GRDP growth in both core and peripherial area had significant effect on GRDP main core city.

Population core and periphery was also found significant but have a negative effect toward both GRDP core Banda Aceh dan Lhokseumawe city. Previous studies that suits with this finding which are study by Kustanto (2020), Bai et al. (2012) that also found that population in both core and peripherial area had significant effect on GRDP main core city.

Then variable distance between core and periphery was found to have a positive and significant effect toward both GRDP core Banda Aceh dan Lhokseumawe city. Previous study in line with this finding is study by Muliadi et al (2017) that also found that distance between core and peripherial area had significant effect on GRDP main core city.

Availability of hospital in core and periphery was found have a negative and significant effect toward both GRDP core Banda Aceh dan Lhokseumawe city. Previous studies are in line with this finding are study by Kustanto (2020), Bai et al. (2012) that also found that availability of hospital in both core and peripherial area had significant effect toward GRDP main core city.

Then the availability of university in core and periphery was found to have a negatif and significant effect toward GRDP core Banda Aceh but have a negatif and significant effect on GRDP core Lhokseumawe city. Previous study that in line with this finding is study by Kustanto (2020) that also found that availability of school in both core and peripherial area had significant effect toward GRDP main core city.

Last one, availability of industry in core and periphery was found to have a negatif and significant effect toward both core Banda Aceh and Lhokseumawe city. Previous study that in line with this finding is study by Baum-Snow et al. (2020), Sharma & Chandrashekar (2014), Bai et al. (2012) that also found that availability of industry in both core and peripherial area had significant effect toward GRDP main core city.

5. Conclusion

This research main focus is to determine the factors that influnced GRDP Banda Aceh and Lhokseumawe city using panel data regression of 23 districts/cities in Aceh Province, Indonesia year 2010-2020. Based on estimastion results, all independent variabels have significant effect toward GRDP Banda Aceh and Lhokseumawe city. Variabels that found have positive effect toward GRDP core Banda Aceh city are GRDP core and periphery, and distance between core and periphery. Variabels that found have negative effect toward GRDP core Banda Aceh city are population, availability of hospital, availability of university and availability of industry. Then, variabels that found have positive effect toward GRDP core Lhokseumawe city are GRDP core and periphery, distance between core and periphery, and availability of university. Variabels that found have negative effect toward GRDP core Lhokseumawe city are population, availability of hospital, and availability of industry.

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