Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

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ABSTRACT: A high economic growth in a region did not guarantee equitable prosperity. Yogyakarta Special Region (DIY) saw significant economic growth, but inequality problems persisted. This study sought to reduce inequality by identifying the growth center and the magnitude of the interaction between the growth center and the buffer areas of DIY Province so that development. It also examined the leading sectors of DIY's regencies and cities. This research utilized the Location Quotient (LQ) analysis method, shift-share analysis, overlay analysis, scalogram analysis, and gravity model analysis. The research findings indicated that each regency/city in DIY had a leading sector that grew faster, contributing to its regional economy and driving the development of other sectors. Different base sectors encouraged DIY regencies/cities to fill in each other's gaps. From 2020 to 2022, Sleman Regency was the growth center in the first hierarchy, and Yogyakarta City in the second. As a result, both regions had a role in encouraging the development of surrounding areas. On the other hand, the buffer area with the most significant interaction with the growth center was Bantul Regency, with an interaction value of 1,462,043,398 with Sleman Regency and 2,622,111,087 with Yogyakarta City. High interaction would enhance economic efficiency.

KEYWORDS: inequality, leading sectors, growth centers, scalogram, gravity model.

I. INTRODUCTION

The Special Region of Yogyakarta (DIY) is the only province in Indonesia that has a Special government structure due to its continuity from the sultanate and duchy administrations that have been adjusted to the governance system of the Unitary State of the Republic of Indonesia (Pemda DIY, 2018). According to data on key development indicators related to economic growth rate, DIY has a high economic growth rate (Bappenas, 2023).

Table 1. Economic Growth Rate of Indonesia and DIY 2020 - 2022.

	2020	2021	2022
Indonesia	-2.07	3.7	5.31
DIY	-2.67	5.58	5.15

Source: BPS 2023

High economic growth does not ensure that the population will enjoy equal prosperity. According to data from the Central Statistics Agency (BPS), the Yogyakarta Special Region (DIY) has the highest income inequality issue in Indonesia (Badan Pusat Statistik, 2023).

Table 2. Gini Ratio of Indonesia and DIY 2020-2022

	2020	2021	2022
Indonesia	0.385	0.381	0.388
DIY	0.422	0.428	0.459

Source: BPS 2023

Yogyakarta City is the city with the highest income inequality in the Yogyakarta Special Region (DIY) (BPS Provinsi DIY, 2023).

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

Table 3. Gini Ratio of Regencies/Cities in DIY 2020-2022.

Regency/City	Average GDP Growth Rate	Average Gini Ratio
Yogyakarta	3.862	0.44
Sleman	3.942	0.42
Bantul	3.908	0.43
Kulon Progo	6.234	0.37
Gunungkidul	4.096	0.33

Source: BPS Data 2023

The Yogyakarta Special Region's (DIY) growth is solely concentrated in the Urban Yogyakarta Area (YKP), according to research (Yusliana and Devi, 2020) and (Rinusara, 2020). According to Castell-Quintana et al. (2015), income inequality is frequently present in areas that serve as economic hubs and are more developed than the surrounding areas (Sitepu and Rahmawati, 2022). According to research done in the province (Subrata, 2018), East Java's economy is growing faster than the country's, but the Gini ratio trend is still rising. As a result, it is claimed that development in East Java is still uneven and has not yet had a significant impact on people's well-being.

One indicator of regional development disparity is the unequal distribution of income between regions (Damayanti, Indrawati, and Septiarini, 2019). Due to the unequal distribution of economic factors among regions, development disparities exist (Sri Hartati, 2022). According to (Sjafrizal, 2012), causes of inequality include variations in the availability of natural resources, differences in regional demographics, barriers to the movement of goods and services, distribution of investments or development funds among regions by the public or private sector, and the concentration of economic activity in particular areas.

Inequality is minimized by identifying regional resources through leading sectors. According to Lewis' research (Basito, Riniati, and Viphindrartin, 2019), efficient interrelationships between each sector's benefits are what propel balanced development. Regional interactions and the growth of growth centers can also help to lessen regional disparities. According to Williamson (1965), significant agglomeration is supported by the interaction of regional interactions, mobility factors, and public policies, resulting in the growth of regional disparities. Regional disparities are reduced in later stages through the growth centers and agglomeration economies (Karimi, Karamelikli, and Heidarian, 2020).

According to Perroux's theory of growth centers, growth does not happen simultaneously in various regions but only occurs in the growth center with varying intensity (Kuncoro, 2004). Scalogram analysis is a method used to identify growth centers. Respati (2015) defines spatial interaction as a relationship between two or more regions that affect each other in some way, such as how quickly each area develops (Emalia and Farida, 2018). Through interaction, underdeveloped regions can experience the results of development from more advanced areas. However, interactions between advanced and lagging regions are not yet at their best (Muazir, 2019).

This study analyzes how to reduce inequality in DIY by analyzing the existing leading sectors, determining growth centers, and assessing interactions among regencies and cities in DIY. The objective is to develop a growth center so that development is not concentrated in a single area but can provide equitable and positive impacts across the regencies and cities of DIY.

II. LITERATURE REVIEW

1. Economic Base Theory

According to Bendavid (Rizani, 2020), the economic base theory depicts regional growth with a high dependence on external (non-local) demand for local goods. Export capability can be an indicator of regional economic development. Export activities of goods and services are known as the base sector.

2. Theory of the Growth Pole

Francois Perroux stipulates two definitions for the growth pole theory in (Tarigan, 2005). Functionally, the growth pole is a location of concentrated business activities because of the dynamic elements in its relationship, which can stimulate economic growth internally and externally. Meanwhile, the geographical definition of a growth pole is a location with a concentration of facilities and conveniences that attract people and encourage the growth of numerous businesses. There are four characteristics associated with growth poles, which include the creation of internal relationships among various economic activities, the existence of a multiplier effect, geographic concentration, and the ability to drive the development of the surrounding areas. A growth pole acts as the hub for a collection of economic activities and can spur the expansion of additional economic activities

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

(Febrianto and Santoso, 2022). A growth pole will spur the development of the area around it if it is situated in a location with plenty of facilities and good potential (Ayu, 2016). Therefore, a growth center is an area with a concentration of facilities and economic activity that can promote the growth of the neighborhood.

3. Gravity Theory

According to W.J. Reilly, gravity theory is a theory that analyzes the strength of interaction between a region and other adjacent regions by measuring the distance and population of the two regions (Priyadi and Atmadji, 2017).

III. METHODOLOGY

This research uses quantitative research because the data were numerical, and the analysis was quantitative or statistical. The locations in this research are districts/cities in the Special Region of Yogyakarta (DIY), namely Sleman Regency, Bantul Regency, Gunungkidul Regency, Kulon Progo Regency, and Yogyakarta City. The data used was secondary data obtained from the Central Statistics Agency (BPS), including BPS DIY Province and the regencies/cities in DIY, as well as from books, relevant articles, and other sources. This research involved four variables:

1. Sectoral income or Gross Regional Domestic Product (GRDP) based on constant prices by employment field in DIY's regencies/cities (in million/year).
2. The service facilities, including:
    a. Government facilities: DIY administrative government offices
    b. Healthcare facilities: general hospitals, specialized hospitals, community health centers, clinics, integrated health posts
    c. Educational facilities: kindergartens, Islamic kindergartens, elementary schools, Islamic elementary schools, junior high schools, Islamic junior high schools, senior high, schools, vocational high schools, Islamic senior high schools, universities
    d. Economic facilities: cooperatives, markets, banks, malls, restaurants, hotels
    e. Communication facilities: post offices, telecommunications
    f. Transportation facilities: airports, seaports, terminals, train stations, public transportation, road networks
    g. Other supporting facilities: electricity networks, water supply networks.
3. Population of DIY's regencies/cities (inhabitants)
4. Distance between DIY's regencies/cities (km).

The analysis method used is:

a. Location Quotients (LQ)

Location Quotients (LQ) is an analytical tool used to test or measure the performance of a region's leading economic sectors (Arsyad, 2010).

$$LQ = \frac{xi}{yi} / \frac{Xi}{Yi}$$

Where:

xi = GRDP of sector i in regency/city

yi = total GRDP of regency/city

Xi = GRDP of sector i in the province

Yi = total GRDP of the province

The results of the LQ calculation can be categorized based on the following criteria (Arsyad, 2010):

- If LQ = 1, the sector in that area is only sufficient to meet its own consumption needs.
- If LQ > 1, the sector in that area is a base sector because it can export to other areas and satisfy domestic demand.
- If LQ < 1, the sector in that area is not a base sector and tends to import goods.

b. Shift Share Analysis

Using shift-share analysis to assess the performance and productivity of economic sectors within a region (regency/city) contrasted with the performance of economic sectors in a larger coverage area (the Province) (Arsyad, 2010). The locational component known as the Differential Shift (D) measures the net regional shift caused by specific industry sectors in that area growing more quickly or more slowly than at the national level due to internal locational factors. If the differential shift value is positive, the region has favorable geographic characteristics, such as resource-rich or resource-efficiency (Tarigan, 2005).

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

$$D_{r,i,t} = \left\{ Y_{r,i,t} - \left(\frac{Y_{N,i,t}}{Y_{N,i,t-n}} \right) Y_{r,i,t-n} \right\}$$

Where:

Dr, i,t = Differential shift of the sector in the analyzed region (regency/city)

Yr, i, t = GRDP of sector i in the regency/city

Yr, i, t-n = GRDP sector i in the regency/city in the previous year

YN, i, t = GRDP sector i in the national region

YN, i, t-n = GDPR sector i in the National Region the year before.

c. Overlay Analysis

Overlay analysis aims to identify economic sectors with potential based on their contributions (LQ analysis) and growth (shift-share analysis) (Arsyad, 2010). According to Yusuf (1999) (Rizani, 2020), it is advisable to identify the leading sectors of a region using more than one analytical tool.

d. Scalogram Analysis

Scalogram analysis with the Guttman scalogram method is used to determine the levels or hierarchy of activity centers based on the number of facilities in a given area. The criteria used in scalogram analysis are the population size and the availability of public facilities. When selecting facilities, it is essential to consider the weight of importance for each facility to produce effective and efficient analysis (Setiono, 2011). Each region in DIY's regencies/city is given a score by considering whether the predetermined facilities are present or absent. A score of one indicates that the regency/city has the specified facilities, while a score of zero indicates that the regencies/city lacks the predetermined facilities. In simple Guttman scalogram analysis, the calculation of error values for each facility and regencies/city is still necessary to ensure data accuracy and consistency. The coefficient of reproducibility index can be used to evaluate whether or not the hierarchical scale of regencies/cities is ideal. According to Guttman, the CR value should be greater than 0.90 (Setiono, 2011).

CR = 1 - $\sum$(error) / (N x K)

Where:

CR = coefficient of reproducibility

N = number of respondents/districts observed

K = number of variables/objects/facilities

Scalogram analysis using the method used to determine

CR = 1 - $\sum$(error) / (N x K)

e. Gravitational Model Analysis

Gravitational model analysis is an analytical tool used to understand regional issues, such as interactions between regions and socio-economic relationships among different areas. Interactions between regions or locations can be considered as masses with attractive forces. The size of the population and the distance between locations affect a location's gravity (Setiono, 2011):

$$F_{12} = K \frac{(P1) \, X \, (P2)}{(d_{12}^2)}$$

Where:

F12 = the attractive force between region A and region B

P1 = population in region A

P2 = population in region B

K = constant

IV. RESULTS AND DISCUSSION

Analysis of leading sector in the regencies/cities DIY Province

1. Sleman Regency

Table 4. Leading Sector Analysis Results Sleman Regency 2020-2022

Sector	LQ	SS	Overlays
Agriculture, Forestry and Fisheries	-	+	-
Mining and Quarrying	-	-	-
Industry Processing	+	+	+
Procurement of Electricity and Gas	-	-	-

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

Supply, Management of Garbage, Waste, and Recycling	-	-	-
Construction	+	+	+
Wholesale and Retail Trade; Car and Motorcycle Repair	-	-	-
Transportation and Warehousing	-	-	-
Provision of accommodation and food and drink	+	-	-
Information and Communication	-	+	-
Financial Services and Insurance	-	+	-
Real Estate	+	+	+
Company Services	+	+	+
Administration Governance, Defense, and Guarantee of Mandatory Social	-	-	-
Education Services	+	+	+
Health Services and Activities Social	-	-	-
Health Services and Activities Social	-	-	-
Other services	-	+	-
Other services	-	+	-

Source: Processed Data, 2023

There are five leading sectors in Sleman Regency, namely the manufacturing industry sector and the construction sector (secondary sector), the real estate sector, and the education sector (tertiary sector). These sectors are base sectors that experience faster growth than the provincial level because the sectors have a positive locational contribution and advantage to Sleman Regency's economy. Therefore, besides meeting its own needs, Sleman Regency can also export to other areas that are less competitive in these sectors. Sleman Regency excels in Large and Medium Industries (IBS) and education. In 2022, there were 220 IBS companies and 37 universities in Sleman Regency. These sectors will drive the development of the administration and construction sectors related to infrastructure development. These sectors must be a priority in development to influence the growth of other sectors.

2.   Yogyakarta City

Table 5. Results of Analysis of Leading Sectors in Yogyakarta City 2020-2022

Sector	LQ	SS	Overlays
Agriculture, Forestry and Fisheries	-	-	-
Mining and Quarrying	-	+	-
Industry Processing	+	-	-
Procurement of Electricity and Gas	+	-	-
Supply, Management of Garbage, Waste and Recycling	+	-	-
Construction	-	-	-
Wholesale and Retail Trade; Car and Motorcycle Repair	-	-	-
Transportation and Warehousing	-	+	-
Provision of accommodation and food and drink	+	-	-
Information and Communication	+	-	-
Financial Services and Insurance	+	-	-
Real Estate	+	+	+
Company Services	+	-	-
Administration Governance, Defense, and Guarantee of Mandatory Social	+	+	+
Education Services	+	-	-
Health Services and Activities Social	+	+	+
Other services	-	-	-

Source: Processed data, 2023

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

The results of the leading sector analysis show that three leading sectors in the city of Yogyakarta meet the base sector criteria and are growing fast, namely the real estate sector, the government administration sector, defense, and mandatory social security, and the health and social activities sector. All three of these sectors belong to the tertiary sector. The tertiary sector is the most diverse and encompasses services or service providers. Yogyakarta City serves as the capital of DIY Province, which results in the growth of numerous tertiary sectors in the city. These tertiary sectors have a positive locational contribution and advantage. Therefore, these leading sectors need to be optimized in development to encourage the growth of other less competitive sectors. So that it can help realize the DIY government program to become The World Heritage City with the identity of The City of Philosophy.

3. Bantul Regency
Table 6. Leading Sector Analysis Results in Bantul Regency 2020-2022

Sector	LQ	SS	Overlays
Agriculture, Forestry and Fisheries	+	+	+
Mining and Quarrying	-	-	-
Industry Processing	+	+	+
Procurement of Electricity and Gas	+	-	-
Supply, Management of Garbage, Waste and Recycling	-	+	-
Construction	-	+	-
Wholesale and Retail Trade; Car and Motorcycle Repair	+	-	-
Transportation and Warehousing	+	+	+
Provision of accommodation and food and drink	+	+	+
Information and Communication	-	-	-
Financial Services and Insurance	-	-	-
Real Estate	-	-	-
Company Services	-	-	-
Administration Governance, Defense, and Guarantee of Mandatory Social	-	-	-
Education Services	-	-	-
Health Services and Activities Social	-	-	-
Other services	-	-	-

Source: Processed data, 2023

The result overlay analysis of the Bantul Regency identified four sectors that qualify as leading sectors with criteria for base sectors and fast growth. These four sectors include the agriculture, forestry, and fisheries sectors (the primary sector), the manufacturing industry sector (the secondary sector), the transportation and warehousing sector, and the accommodation and food service providers sector (the tertiary sector). The topography of the Bantul Regency is different. The fertile soil and the region's location close to the Indian Ocean make Bantul Regency superior in the agricultural, forestry, and fisheries sectors. The number of Large and Medium-Sized Industries (LMIs) in Bantul Regency increased from 167 to 193 in 2022. Thus, this also influences the growth of the transportation, warehousing, and accommodation sectors. These four sectors have positive locational advantages that can increase Bantul Regency's income through export activities. The leading sectors have a role in driving the development of other sectors, ensuring that all sectors grow evenly and preventing concentration in specific sectors.

4. Kulon Progo Regency
Table 7. Leading Sector Analysis Results in Kulon Progo Regency 2020-2022

Sector	LQ	SS	Overlays
Agriculture, Forestry and Fisheries	+	-	-
Mining and Quarrying	+	+	+
Industry Processing	-	+	-
Procurement of Electricity and Gas	-	-	-
Supply, Management of Garbage, Waste, and Recycling	+	+	+

Sector	LQ	SS	Overlays
Construction	+	-	-
Wholesale and Retail Trade; Car and Motorcycle Repair	+	+	+
Transportation and Warehousing	+	+	+
Provision of accommodation and food and drink	-	+	-
Information and Communication	-	+	-
Financial Services and Insurance	-	-	-
Real Estate	-	+	-
Company Services	-	+	-
Administration Governance, Defense, and Guarantee of Mandatory Social	-	-	-
Education Services	-	-	-
Health Services and Activities Social	-	-	-
Other services	+	-	-

Source: Processed data, 2023

Kulon Progo Regency has four leading sectors with criteria for base sectors and fast growth. These sectors include the mining and quarrying sector (the primary sector), the supply, and management of garbage, waste, and recycling sector (the secondary sector), the wholesale and retail trade, the repair of motor vehicles, and the transportation sector (the tertiary sector). The Kulon Progo Regency area borders directly on the Indian Ocean, so it is rich in marine resources and iron sand mining. Additionally, Kulon Progo Regency serves as a development area for the Regional Drinking Water Supply System (SPAM) and a Sanitary Landfill (TPA). Kulon Progo Regency has a port, airport, train station, and terminal to facilitate transportation and delivery of goods and services. Therefore, these superior sectors have a faster contribution and growth, so they can export to increase regional income and encourage the development of other less advanced sectors.

5. **Gunungkidul Regency**

Table 8. Leading Sector Analysis Results in Gunungkidul Regency 2020-2022

Sector	LQ	SS	Overlays
Agriculture, Forestry and Fisheries	+	-	-
Mining and Quarrying	+	+	+
Industry Processing	-	-	-
Procurement of Electricity and Gas	-	-	-
Supply, Management of Garbage, Waste, and Recycling	+	+	+
Construction	-	+	-
Wholesale and Retail Trade; Car and Motorcycle Repair	+	+	+
Transportation and Warehousing	+	+	+
Provision of accommodation and food and drink	-	+	-
Information and Communication	-	+	-
Financial Services and Insurance	-	-	-
Real Estate	-	+	-
Company Services	-	+	-
Administration Governance, Defense, and Guarantee of Mandatory Social	+	-	-
Education Services	-	+	-
Health Services and Activities Social	-	+	-
Other services	+	+	+

Source: Processed data, 2023

The overlay results show that Gunungkidul Regency has five leading sectors with criteria for base sectors and fast growth. These leading sectors include the mining and quarrying sector (the primary sector), the water supply, waste management,

recycling sector (the secondary sector), the wholesale and retail trade, repair of motor vehicles, the transportation and warehousing sector, and other services (the tertiary sector). The area of Gunungkidul Regency consists of hills and a coastline, which renders Gunungkidul Regency abundant in mining products (limestone) and marine products. Positive locational contributions and benefits show that these sectors can help other sectors develop and can drive export activities to increase the income of Gunungkidul Regency. To further improve and distribute the economy of Gunungkidul Regency fairly, it is crucial to maximize these five development sectors.

Analysis determines the central area growth with analysis scalogram Guttman scale

Table 9. Analysis Results Scalogram Regency /City of DIY Province 2020-2022

Regency /City	2020	2021	2022
Sleman Regency	I	I	I
	30	30	30
	1125804	1136474	1147562
Yogyakarta City	II	II	II
	30	30	30
	373589	376324	378913
Kulon Progo Regency	III	III	III
	29	29	29
	436395	443283	451432
Bantul Regency	IV	IV	IV
	28	28	28
	985770	998647	1013170
Gunungkidul Regency	V	V	V
	28	28	28
	747161	758168	770883
COR	0.9375	0.9375	0.9375

Source: Processed data, 2023

Line 1: hierarchy; line 2: amount type facilities; line 3: population

The regencies/city in the DIY Province that has the most types of facilities and the largest population is Sleman Regency, with 30 types of facilities and a population of 1,147,562 people in 2022, making it the first hierarchy. Yogyakarta City also has 30 types of facilities, but its population in 2022 is only 378,913 people, smaller than Sleman Regency, so Yogyakarta City is the second hierarchy. In the third hierarchy is Kulon Progo Regency, with 29 types of facilities and a population of 451,432 people. Bantul Regency and Gunungkidul Regency have the same number of facilities, which are 28 types. However, the Bantul Regency has a population of 1,013,170 people in 2022, while the Gunungkidul Regency has a population of 770,883. Therefore, the Bantul Regency is the fourth hierarchy (IV), and the Gunungkidul Regency is the fifth hierarchy (V).

In the results of the scalogram analysis for DIY Province regencies/cities, the CR index is higher than 0.90. From 2020 to 2022, the CR index for DIY Province regencies/cities is 0.9375, which shows that the hierarchical scale of DIY Province regencies/cities is ideal.

According to the scalogram analysis using the Guttman scale method, the economic growth centers of DIY Province from 2020 to 2022 are Sleman Regency and Yogyakarta City because they have many facilities and a large population. The larger the population in regencies/cities, the larger the scale and the number of activities. As the population increases, the number of facilities also increases. This result enhances the attractiveness and drives economic growth in those areas. Therefore, Sleman Regency and Yogyakarta City have a role in encouraging the development of surrounding areas, namely Bantul, Kulon Progo, and Gunungkidul, to reduce regional disparities.

These results by the research (Priyadi and Atmadji, 2017) and (Sitepu and Rahmawati, 2022) analyzed the growth centers of DIY in the previous years, stating that the growth centers of DIY Province are Yogyakarta City and Sleman Regency. Yogyakarta City is the capital of DIY Province, functioning as the provincial administrative hub and an educational center of DIY province. On the other hand, Sleman Regency is the center of growth in industry, transportation networks, and university. Therefore, make the regions the growth centers of DIY Province, which expects to propel the development of surrounding areas.

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

Analysis of interaction between central regions' growth with the surrounding area or supporter

Table 10. Gravity Model Analysis Results in DIY Regency /City 2020-2022

Origin (1)	Goal (2)	Interaction (F_{12})	Rank
Sleman Regency	Bantul	1,462,043,398	1
	Gunungkidul	23,3891,477	3
	Kulon Progo	467.175.472	2
Yogyakarta City	Bantul	2,622,111,087	1
	Gunungkidul	124,177,953	3
	Kulon Progo	216,630,303	2

Source: Processed data, 2023

The regency with the highest level of interaction with the Sleman Regency is the Bantul Regency, with an interaction value of 1,462,043,398. Following that is Kulon Progo Regency, which has an interaction value of 467,175,472, and Gunungkidul Regency, which has an interaction value of 233,891,477. Bantul Regency also has the highest interaction value with Yogyakarta City, which is 2,622,111,087. Kulon Progo Regency and Gunungkidul Regency have interaction values of 216,630,303 and 124,177,953 with Yogyakarta City, respectively.

The distance between Bantul Regency and Sleman Regency is only 28.2 km, closer than between Kulon Progo Regency (33.3 km) and Gunungkidul Regency (61.5 km) to Sleman Regency. Likewise, Bantul Regency is closer to Yogyakarta City than Kulon Progo Regency (28.1 km) and Gunungkidul Regency (48.5 km), with a distance of only 12.1 km.

Population size can also influence the interaction of a region. Population size determines the mass of a location. Unlike distance, the larger the mass (population), the stronger the attraction. A larger population tends to appeal to people for business, work, and other activities. Bantul Regency, besides being closer in distance to Sleman Regency and Yogyakarta City, also has a larger population (1,013,170 people) compared to Kulon Progo Regency (451,432 people) and Gunungkidul Regency (770,883 people).

So, the supporting regions for the growth center are the Bantul Regency, Kulon Progo Regency, and Gunungkidul Regency. A high interaction value can reduce costs, time, and effort. It also allows for efficiency in exporting goods. Additionally, with good supporting infrastructure, the distribution of development outcomes (facilities) can be enjoyed evenly by the areas around the growth center (Bantul Regency, Kulon Progo Regency, and Gunungkidul Regency).

V. CONCLUSION

1. The results of the overlay analysis indicate that each regency/city in DIY has significant sectors that can contribute to the development of other sectors. Distinct leading sectors foster interconnections and mutual relationships between regions to compensate for each other's deficiencies in the regencies/cities.

2. The results of the growth center determination using scalogram analysis show that the growth center of DIY Province from 2020 to 2022 was Sleman Regency at Hierarchy I and Yogyakarta City at Hierarchy II. These two regions had 33 types of facilities, but the population of Sleman Regency (1,147,562 people) was greater than that of Yogyakarta City (378,913 people). These two regions had a role in stimulating the growth of their surrounding areas to ensure even development.

3. Bantul, Kulon Progo, and Gunungkidul regencies are the supporting regions of Sleman Regency and Yogyakarta City. Bantul Regency has the highest interaction value with Sleman Regency (1,462,043,398) and Yogyakarta City (2,622,111,087) due to their proximity and large population. Strong interaction and adequate infrastructure will enhance efficiency in economic activities between regencies/cities in DIY Province.

Development in DIY Province can be carried out more evenly in buffer regions like Gunungkidul, Bantul, and Kulon Progo so that it doesn't concentrate solely on the growth center. For instance, optimizing the Southern Java Road Corridor (JJLS) and improving transportation infrastructure can foster economic development in coastal areas such as Gunungkidul, Kulon Progo, and parts of Bantul.

In addition to population size, the number of facilities, and distance, other factors must be noticed in determining the growth center and regional interactions. These factors include geographical conditions, economic factors, social conditions, politics, and institutional aspects in the region. Further research should conduct analysis using even more complex analytical tools to determine the growth centers and regional interactions.

Leading Sector and Growth Center Analysis to Minimizing Inequality in the Special Region of Yogyakarta Province

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