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Mapping The Transformation of Economic Structure in Solo Raya in 2014-2023: Geospatial Approach

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Abstract

Indonesia has a variety of geographical landscapes that can affect the economic structure in each of its regions. This study aims to understand changes in the contribution and growth of economic sectors in the Solo Raya region, as well as to identify spatial patterns in economic transformation in 2014-2023. The method used is quantitative descriptive with a geospatial approach, using Location Quotient (LQ) and Dynamic Location Quotient (DLQ) analysis tools, Growth Ratio Model (MRP), and overlay analysis mapped with software Tableau. The results showed that the economic structure of Solo Raya was transformed from 2014 to 2023. Some districts, such as Boyolali, changed from category 1 to category 2 in the MRP analysis, while other districts, such as Sukoharjo and Sragen, underwent the opposite transformation. Overall, in the LQ and DLQ analysis, the processing industry sector and the financial services sector have great potential to be developed to support economic growth in the Solo Raya area. In addition, the overlay results show that some districts still make significant contributions but have small growth, while other districts do not experience significant changes in their economic structure.

Keywords: Leading Sector, Regional Economy, Geospatial, Solo Raya
JEL classification: B55, C33, C82, O11, R11

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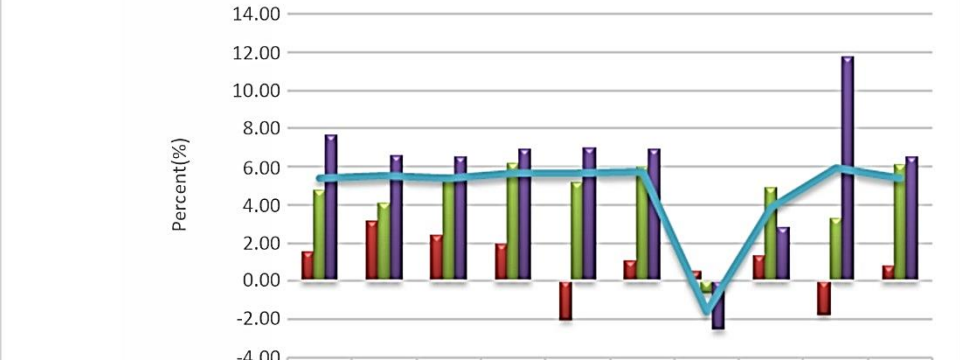
1. INTRODUCTION

Indonesia, as the largest archipelagic country in the world, has very diverse geographical conditions. Indonesia's geographical diversity causes significant variations in the economic structure of each region. For example, coastal areas may focus more on the tourism and fisheries sectors, while inland areas may rely more on agriculture and manufacturing industries. As a result, the economic structure in each region is also different. Therefore, understanding the transformation of the economic structure is very important to

identify comparative advantages and develop the economic potential of each region (Ariyanto et al. 2024).

Economic structure transformation is the process by which the composition of a country's economic sector changes from one form to another over time. According to Todaro and Smith (2020), this transformation typically entails a considerable transition from agriculture to industry, followed by a shift toward the service sector. This process represents a movement from the primary sector to the non-primary sectors, specifically the secondary and tertiary sectors (Herdianti et al. 2015).

In the Solo Raya (Subosukawonosraten) area, which includes Surakarta City, Boyolali Regency, Sukoharjo Regency, Karanganyar Regency, Wonogiri Regency, Sragen Regency, and Klaten Regency, economic growth is used as an indicator of development success. In development planning, analysis of regional economic structure is fundamental as a basis for determining the direction of regional development (Abadi, 2020).



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Primary Sector	1.55	3.16	2.38	1.93	-1.98	1.10	0.51	1.33	-1.73	0.81
Secondary Sector	4.78	4.06	5.54	6.15	5.16	5.96	-0.63	4.87	3.31	6.11
Tertiary Sector	7.63	6.60	6.52	6.92	6.99	6.91	-2.49	2.83	11.76	6.49
Total Growth	5.43	5.55	5.42	5.69	5.70	5.73	-1.58	3.85	5.91	5.39

Figure 1 Economic Growth and Economic Sectors in Solo Raya (2014–2023)
Source: Statistics Office of Central Java Province (2024), processed

Figure 1 shows the growth of the economic sector in Solo Raya during the 2014–2023 period, there is a dynamic contribution between sectors that reflects the structural transformation of the economy. The primary sector showed a fluctuating growth trend with a declining contribution, especially in 2018 and 2022, even experiencing negative growth in several years. In contrast, the tertiary sector showed significant growth, especially in 2022 with a growth of 11.76%, reflecting the region's economic shift to a service-based sector. The secondary sector, although it was affected in 2020 with negative growth (-0.63%) due to the pandemic, managed to recover and recorded a positive growth of 6.11% in 2023. Total economic growth also recovered after a sharp decline in 2020 (-1.58%), returning to a growth

rate of around 5% in the following years. This data emphasizes the importance of research on structural transformation, considering the shift in the role of economic sectors in supporting the sustainability of regional development.

Research by Harini et al. (2021) shows that the agricultural sector has a significant contribution to the local economy in the Karangsambung-Karangbolong Geopark area, reflecting similar potential in the Solo Raya. Setyari et al. (2022) emphasized that leading sectors can be the main drivers of economic growth, especially in the context of the impact of the COVID-19 pandemic in Bali, while Tanjung et al. (2021) recommended the priority of leading subsectors in agriculture, forestry, and fisheries in Bangka Belitung as a reference for strengthening the sector in the Solo Raya.

In addition, research by Imbran (2022) and Rinaldi et al. (2022) found that economic growth can influence shifts in economic structure, while Ardina et al. (2020) and Abadi (2020) employed methods such as location quotient, shift-share, growth ratio model, and overlay analysis to demonstrate that structural transformation from the primary to secondary and tertiary sectors is essential for boosting economic growth. However, these studies primarily focus on macro-level trends and overlook the spatial heterogeneity of economic transformation across regions. Unlike previous research, this study aims to fill the empirical gap by incorporating a spatial dimension, using geospatial analysis to capture variations in structural transformation within the Solo Raya region. By doing so, this research positions itself uniquely in contributing to a more nuanced understanding of how economic changes unfold at the sub-regional level, providing insights that are crucial for targeted policy-making.

In this study, the geospatial approach becomes relevant to understanding economic transformation in Solo Raya. This approach allows for a more detailed analysis of spatial patterns in economic transformations. This study will describe the spatial distribution of economic growth using spatial data and mapping techniques. It will seek the contribution of economic sectors in the Solo Raya area.

This research focuses on the transformation of the economic structure in Solo Raya (2014–2023) to understand the shift in the contribution of economic sectors. Although it does not explicitly examine inclusivity, the results of this analysis can provide insights for policymakers to design more inclusive development strategies. An understanding of fast-growing sectors, such as the tertiary sector, can help prioritize policies that support equitable distribution of development benefits and the reduction of social disparities.

2. RESEARCH METHOD

This research employs a quantitative descriptive methodology that incorporates a geospatial perspective, similar to the approaches utilized in various prior studies (Saputra et al., 2024; Setiawan, 2023). The data used in this study is sourced from the Central Statistics Agency (BPS), which consists of panel data on Gross Regional Domestic Product (GRDP) on the basis of constant prices (ADHK) based on business sectors in Central Java from 2014 to 2023. This period was chosen because of its relevance and importance in analyzing long-term economic trends, which allows the identification of structural changes in the regional

economy. The data is divided into two analysis periods, namely 2014-2018 and 2019-2023, with the aim of conducting comparative analysis and looking at changes in the economic structure of GRDP. This study uses three methods:

2.1. Location Qoutient (LQ) and Dynamic Location Qoutient (DLQ) Analysis

The LQ analysis method is used to identify leading commodities by comparing the significance of a commodity in the study area to the significance of that commodity at the broader regional level (Jafar & Meilvidiri, 2021; Morrissey, 2016). Here is the LQ

formula: $LQ = \left(\frac{Q_{ij}/Q_j}{Q_{ir}/Q_r}\right)$ ..... (1)

LQ = Sector i LQ coefficient
Qij = GRDP sector i in the study area
Qj = Total GRDP in the study area
Qir = GRDP sector i in the reference area
Qr = Total GRDP in the reference region

The DLQ analysis technique represents an advancement of the LQ method, aimed at assessing the future growth potential of key commodities (Faid et al., 2018; Nurmayenti et al., 2023). The formula employed in the DLQ approach is:

$DLQ = \left(\frac{(1+Gij)/(1+Gj)}{(1+Gip)/(1+Gp)}\right)^t$ ..... (2)

DLQ = DLQ coefficient sector i
Gij = Average GRDP growth of sector i in the study area
Gj = Average total GRDP growth in the study area
Gip = Average GRDP growth of sector i in the reference region
Gp = Average total GRDP growth in the reference region
t = Time (year)

2.2. Growth Ratio Model (MRP)

The MRP is an analytical technique employed to assess the growth of activities at both micro and macro levels (Widyaningrum & Cahyono, 2020). This approach to MRP analysis can be categorized into two distinct types::

1) Growth ratio of reference region (RPr)

$RPr = \frac{\Delta E_{iR}/E_{iR(t)}}{\Delta E_R/E_{R(t)}}$ ..... (3)

RPr = Growth ratio of reference region
ΔE_{iR} = Changes in sector i revenue in the reference region in periods t and t+1
ΔE_R = Changes in sector i GRDP in the reference area
$E_{iR(t)}$ = Sector i revenue in the reference region in the period t
$E_{R(t)}$ = GRDP revenue in the reference region in the period t
t = Time (year)

2) Study area growth ratio (RPs)

$$RPs = \frac{\Delta E_{iS}/E_{iS(t)}}{\Delta E_S/E_{S(t)}} \quad \text{.....(4)}$$

RPs = The growth ratio of the study area
ΔE_{iS} = Changes in sector i income in the study area in periods t and t+1
ΔE_S = Changes in GRDP sector i in the study area
$E_{iS(t)}$ = Sector i income in the study area in the period t
$E_{S(t)}$ = GRDP income in the study area in the period t
t = Time (year)

2.3 Overlay Analysis

In this study, overlay analysis is a mapping of LQ analysis and MRP analysis using Tableau software (Widyaningrum & Cahyono, 2020). Four criteria need to be considered in overlay analysis, namely:

1) Contribution (+) and growth (+) indicate that the sector makes a significant contribution and is growing.
2) Contribution (+) and growth (-) indicate that the sector makes a significant contribution but has small growth.
3) Contribution (-) and growth (+) indicate that the sector has significant growth but a small contribution.
4) Contribution (-) and growth (-) indicate that the sector is not potential.

3. RESULTS AND DISCUSSION

3.1 Location Qoutient (LQ) and Dynamic Location Qoutient (DLQ) Analysis

Based on data analysis that researchers have carried out, the LQ generated from mapping the 2014-2018 and 2019-2023 periods is shown in Figures 2 and 3.

Based on Figures 3 and 4, the LQ analysis for Solo Raya indicates a dynamic transformation in the economic structure, which includes primary, secondary, and tertiary sectors. There was also a significant change in the potential base sector between the 2014-2018 and 2019-2023 periods in some regions, while other regions remained stable without significant changes during the observation period. This result illustrates that each region

chooses to focus on the development of its superior sectors, reflecting the region's ability to adapt and strengthen sectors that have comparative advantages.

These findings support the broader theory of economic transformation as explained by Todaro and Smith (2020), where an economy undergoes a transition from the agricultural sector (primary) to the industrial sector (secondary) and finally the service sector (tertiary). This process is a typical characteristic of modern economic development, in which regions are shifting from dependence on natural resources to more manufacturing- and service-oriented sectors, which in turn drives productivity and more sustainable economic growth.

In Boyolali Regency, there have been changes in the structure of the economic sector during the 2014-2018 and 2019-2023 periods. Initially, there were 7 sectors, which included agriculture, forestry, and fisheries; mining; transportation and warehousing; company services; educational services; health services and social activities; and other services. However, over time, there was a transformation, and the company's service sector, which was a base sector, turned into a non-base sector. This situation led to a change in 6 sectors. This change can be explained by measures to diversify the regional economy. The government and local economic actors are working to develop other sectors to reduce dependence on the corporate services sector, creating a more balanced economic structure. As a result, the contribution of this sector to the total GRDP has decreased. LQ analysis shows a decline in the company's service sector advantage, with the LQ value from 1.00 (2014-2018) to 0.99 (2019-2023), indicating that this sector is no longer the main driver of the regional economy.

In Karanganyar Regency during the 2014-2018 period, there are 7 base sectors. They include the processing industry sector, procurement of electricity and gas, water supply, provision of accommodation and food and drink, financial services, real estate, and educational services. However, in the 2019-2023 period, there has been a change in the real estate sector. Education services are no longer included in the base sector, so there are only 5 sectors that are the main focus in Karanganyar District. The change in the real estate and education services sector from the basic sector to the non-base sector in Karanganyar is due to the development of other sectors that are more dominant, such as the processing industry and financial services. This economic diversification shifts the focus of investment and labor market, so that the contribution of the real estate and education sectors to GDP has relatively decreased. The Location Quotient (LQ) analysis shows a decline in the LQ value of these two sectors below 1 during the 2019-2023 period, which indicates that these sectors no longer have a local advantage over the national average.

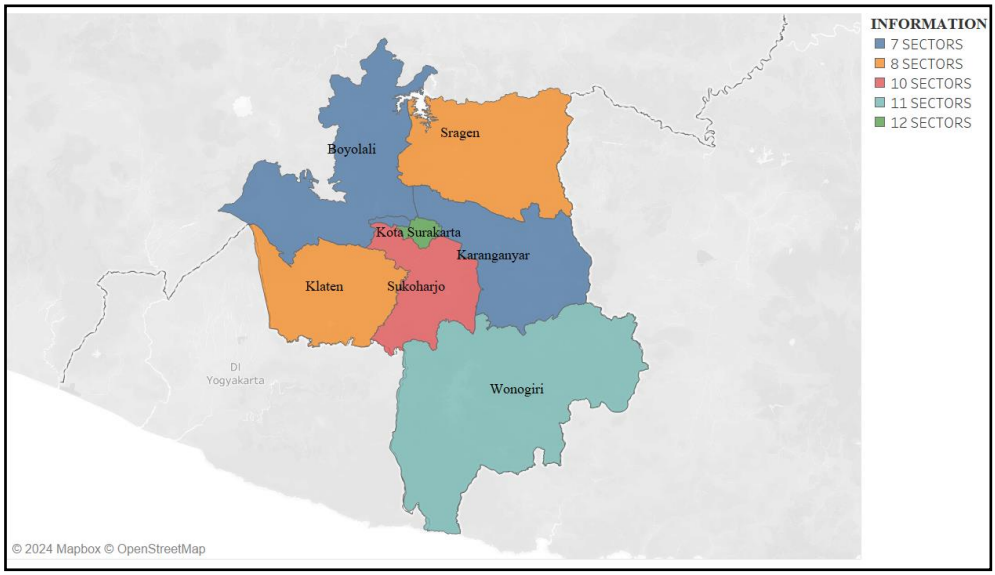


Figure 2 LQ Analysis Mapping in Solo Raya in 2014-2018

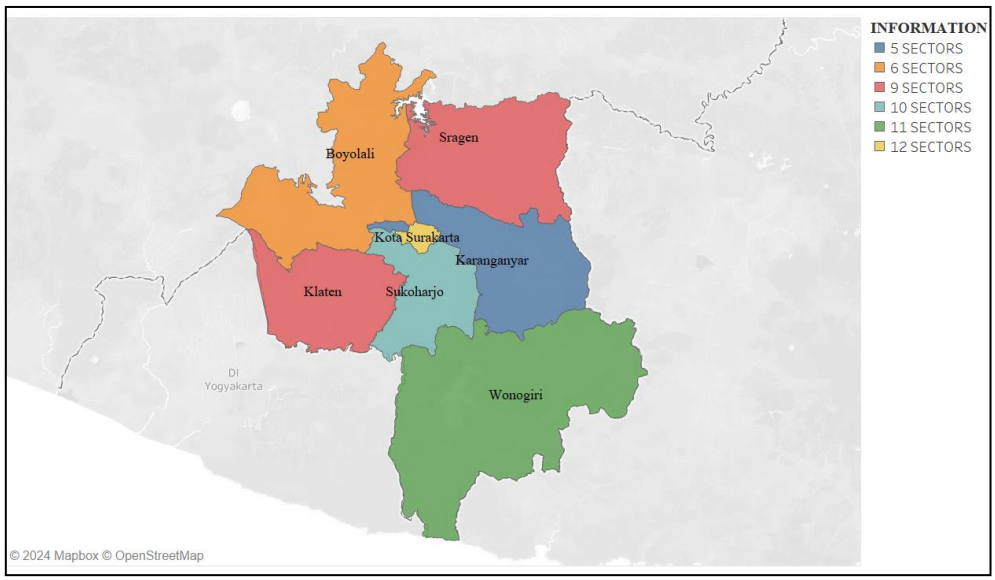


Figure 3 LQ Analysis Mapping in Solo Raya 2019-2023

In Klaten Regency, there has been a change in the base sector from 8 to 9 sectors. This change occurred in the 2014-2018 time frame, which included the mining and quarrying sector; procurement of electricity and gas; wholesale-retail trade and repair of cars and motorcycles; provision of accommodation and food and beverages; financial services; educational services; health services and social activities; and other services. However, in the 2019-2023 period, there have been changes in Klaten Regency, where the processing industry sector is the base sector, so there are 9 base sectors in Klaten Regency. The change of the

processing industry sector to a base sector in Klaten is due to the increase in productivity and competitiveness of this sector, both in the local and national markets. This is reflected in the LQ value which increased from 0.97 in the 2014-2018 period to 1.03 in the 2019-2023 period, which shows that the processing industry sector has a local advantage compared to the national average. This increase makes the processing industry sector the main pillar of the regional economy.

In the district of Sragen, there was a change in the base sector. In the 2014-2018 period, there were 8 base sectors, including agriculture, forestry, and fisheries; mining and quarrying; electricity and gas procurement; water supply; wholesale and retail trade, as well as the repair of cars and motorcycles; company services; educational services; and other services. However, in the 2019-2023 period, there was a change to 9 base sectors. These changes include the procurement of water, which is no longer a base sector, as well as the addition of the treatment industry sector and the provision of accommodation and food and drink, which was not previously a base sector, which became a base sector. These changes can be attributed to economic diversification efforts in the region, which led to the development of more productive sectors. The water supply sector, which once played a pivotal role, saw a decline in its contribution to the GRDP, causing it to lose its base sector status. Conversely, the processing industry and the accommodation and food and drink sectors experienced significant growth, driven by increased production, local consumption, and tourism. Data from the BPS further supports this shift, showing that these two sectors have become substantial contributors to Sragen's economy, highlighting their new status as key pillars of regional economic growth.

In Solo Raya, three regions did not undergo base sector transformation in the 2014-2018 and 2019-2023 periods. The three regions are Sukoharjo Regency, Wonogiri Regency, and Surakarta City. Sukoharjo Regency has a base sector that includes the processing industry; procurement of electricity and gas; wholesale and retail trade, as well as the repair of cars and motorcycles; transportation and warehousing; provision of accommodation and food; information and communication; financial services; real estate; company services; and health services and social activities. Meanwhile, Wonogiri Regency has basic sectors in the form of agriculture, forestry, and fisheries; mining and quarrying; water supply; wholesale and retail trade, as well as the repair of cars and motorcycles; transportation and warehousing; financial services; company services; government administration, defense, compulsory social security; educational services; health services and social activities; and other services. Finally, Surakarta City has a base sector that includes the procurement of electricity, gas, and water supply; construction; wholesale and retail trade, as well as the repair of cars and motorcycles; provision of accommodation and food; information and communication; financial services; real estate; company services; government administration, defense, compulsory social security; educational services; and health services and social activities. These regions have maintained a strong reliance on specific sectors that consistently demonstrate competitive advantages. For instance, Surakarta City continues to thrive on trade and services due to its status as a regional hub, while Wonogiri and Sukoharjo

rely on agriculture, manufacturing, and textiles sectors deeply embedded in their economic structures (Sulistyowati et al., 2022).

Based on Table 1, it can be seen that in each region in Solo Raya, almost all sectors have DLQ values greater than 1. This result suggests that these sectors have strong growth potential and are likely to become important economic base sectors in the future. According to research by Hutajulu et al. (2018), sectors with DLQ values greater than 1 are considered "prospective" because they indicate that the sector's growth rate exceeds the overall regional growth, demonstrating its competitive advantage. However, several sectors in the region have DLQ values of less than 1, indicating that these sectors are not expected to grow at a rate sufficient to contribute significantly to future economic development. As suggested by Layasari et al. (2021), sectors with DLQ values below 1 are typically less competitive and may face stagnation or even decline, making them less viable as economic base sectors moving forward. This differentiation helps identify which sectors should be prioritized for development to drive sustainable growth in the region.

Table 1 also shows that the processing industry sector and the financial services sector in Solo Raya have potential that can be expanded in the future. However, the mining and quarrying sector in Solo Raya does not show the same potential and tends not to get priority compared to other sectors. This fact indicates that the Solo Raya is undergoing a change in economic structure from the primary sector to the secondary sector and from the secondary sector to the tertiary sector.

The financial services sector in Solo Raya shows great potential in supporting regional economic growth. These findings are in line with the global trend where the financial services sector is rapidly developing through digitalization and restructuring that strengthens labor productivity despite the overall decline in the number of workers (Rodrigues et al., 2022; Vu & Asongu, 2023). In addition, the potential of the processing industry sector in Solo Raya in encouraging economic growth and labor absorption is in line with the findings of international studies that show the importance of Total Factor Productivity (TFP), Labor Quality, and digital transformation in increasing the productivity of the industrial sector. A combination of key elements such as the availability of raw materials, infrastructure, skilled labor, and policy support are the main determinants of the success of the sector (Waldman & Jensen, 2016).

This finding is also in line with previous research by Soebagyo and Hascaryo (2016), Arif and Purnomo (2017), and Winardi et al. (2021), which show that the processing industry and financial services sector play a key role in regional development. This is reinforced by factors such as technological innovation, supportive regulations, increased financial literacy, and network connectivity, which are the driving force for the growth of the financial services sector (Otoritas Jasa Keuangan, 2021).

The combination of a strong processing and financial services industry sector, supported by digital transformation and adaptive regulation, will be an important pillar in sustainable economic development in the Solo Raya. Digitalization not only accelerates the growth of the financial services sector, but also increases the Total Factor Productivity (TFP) of the industrial sector, thereby providing a positive multiplier effect on labor absorption and regional economic welfare.

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Table 1. Results of DLQ Analysis in Solo Raya 2014-2023

Business Field (DLQ)	Boyolali		Karanganyar		Klaten		Sragen		Sukoharjo		Surakarta		Wonogiri	
	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information
A. Agriculture, Forestry, and Fisheries	1.20	Perspective	1.12	Perspective	1.05	Perspective	0.91	Non Perspective	1.06	Perspective	1.22	Perspective	1.03	Perspective
B. Mining and Quarrying	0.91	Non Perspective	0.74	Non Perspective	0.96	Non Perspective	0.93	Non Perspective	0.59	Non Perspective	-0.78	Non Perspective	0.73	Non Perspective
C. Processing Industry	1.34	Perspective	1.16	Perspective	1.23	Perspective	1.39	Perspective	1.10	Perspective	1.09	Perspective	1.30	Perspective
D. Procurement of Electricity, Gas	1.10	Perspective	0.98	Non Perspective	1.08	Perspective	0.90	Non Perspective	0.85	Non Perspective	1.04	Perspective	1.05	Perspective
E. Water Procurement	0.95	Non Perspective	1.03	Perspective	1.07	Perspective	1.01	Perspective	1.10	Perspective	0.88	Non Perspective	1.08	Perspective
F. Construction	1.15	Perspective	1.14	Perspective	1.33	Perspective	1.01	Perspective	1.04	Perspective	0.89	Non Perspective	1.10	Perspective
G. Wholesale and Retail Trade and Repair of Automobiles and Motorcycles	1.07	Perspective	1.07	Perspective	0.90	Non Perspective	1.04	Perspective	1.03	Perspective	1.00	Perspective	1.06	Perspective

Business Field (DLQ)	Boyolali		Karanganyar		Klaten		Sragen		Sukoharjo		Surakarta		Wonogiri	
	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information
H. Transportation and Warehousing	1.17	Perspective	1.00	Perspective	1.00	Perspective	0.93	Non Perspective	1.01	Perspective	1.18	Perspective	0.95	Non Perspective
I. Provision of Accommodation and Food and Drink	1.07	Perspective	1.05	Perspective	1.00	Non Perspective	1.13	Perspective	0.98	Non Perspective	1.11	Perspective	0.99	Non Perspective
J. Information and Communication	1.10	Perspective	0.94	Non Perspective	0.93	Non Perspective	1.10	Perspective	1.15	Perspective	0.98	Non Perspective	1.13	Perspective
K. Financial Services	1.17	Perspective	1.07	Perspective	1.04	Perspective	1.12	Perspective	1.04	Perspective	1.04	Perspective	1.09	Perspective
L. Real Estate	1.12	Perspective	0.96	Non Perspective	1.02	Perspective	1.05	Perspective	1.06	Perspective	0.99	Non Perspective	0.96	Non Perspective
M, N. Corporate Services	1.09	Perspective	1.07	Perspective	0.98	Non Perspective	1.05	Perspective	1.03	Perspective	0.95	Non Perspective	1.05	Perspective
O. Government Administration, Defense, and Compulsory Social Security	0.96	Non Perspective	0.92	Non Perspective	1.03	Perspective	1.07	Perspective	1.08	Perspective	1.08	Perspective	1.07	Perspective
P. Education Services	1.12	Perspective	0.96	Non Perspective	1.02	Perspective	1.08	Perspective	1.05	Perspective	0.94	Non Perspective	1.07	Perspective

Business Field (DLQ)	Boyolali		Karanganyar		Klaten		Sragen		Sukoharjo		Surakarta		Wonogiri	
	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information	Value	Information
Q. Health Services and Social Activities	1.02	Perspective	0.99	Non Perspective	1.04	Perspective	1.01	Perspective	1.07	Perspective	1.06	Perspective	1.07	Perspective
R, S, T, U. Other services	1.01	Perspective	1.18	Perspective	1.03	Perspective	1.02	Perspective	1.07	Perspective	0.79	Non Perspective	1.03	Perspective

Source: Statistics office of Central Java Province (2024), processed

3.2 Growth Ratio Model (MRP)

Based on the analysis conducted over two periods (2014-2018 and 2019-2023), RPr and RPs values were derived and grouped into four categories that depict the main economic activities in each region within the Solo Raya. Category 1 shows significant growth in both regions, fostering opportunities for equitable economic development and mutual support. Category 2 reflects rapid growth in the reference region, while the study region shows little to no growth, highlighting economic disparities that require targeted interventions to stimulate growth in the study region. Category 3 indicates that the study region has experienced growth, even though the reference region remains stagnant, signaling inequality that must be addressed to prevent further divergence. Category 4 represents stagnation in both regions, signaling deeper structural issues within the economy, and necessitating aggressive policy measures to spur economic recovery and development (Widyaningrum & Cahyono, 2020).

Changes in the economic structure in Solo Raya, as depicted in Figures 4 and 5 through the MRP analysis, highlight varying regional dynamics between the 2014-2018 and 2019-2023 periods. In Boyolali Regency, there was a shift from Category 1, indicating strong growth at both the district and provincial levels, to Category 2, where growth remained dominant in Central Java but slowed in Boyolali. This change may reflect challenges such as limited economic diversification or infrastructure constraints, reducing Boyolali's relative competitiveness. Conversely, Sragen and Sukoharjo Regencies transitioned from Category 2 to Category 1, signaling substantial progress in local economic activities. This improvement

could stem from strategic investments, policy interventions, or the successful development of competitive sectors that aligned these regencies with provincial growth trends.

Meanwhile, Karanganyar, Klaten, and Wonogiri Regencies maintained their positions in Category 1 across both periods, suggesting stability in their economic performance, likely driven by resilient sectors and favorable investment climates. The City of Surakarta, however, remained in Category 2, highlighting ongoing challenges in achieving significant growth relative to Central Java Province.

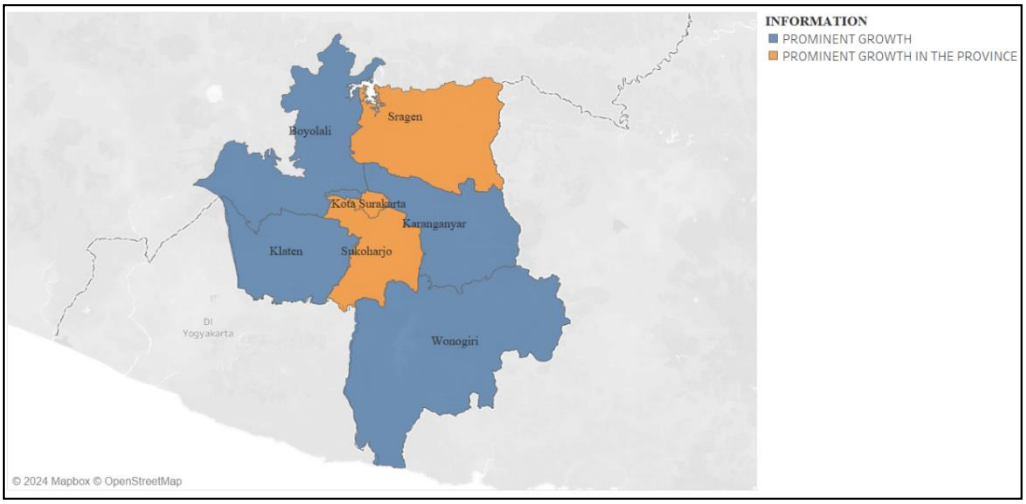

Figure 4 Growth Ratio Model (MRP) Mapping in Solo Raya in 2014-2018

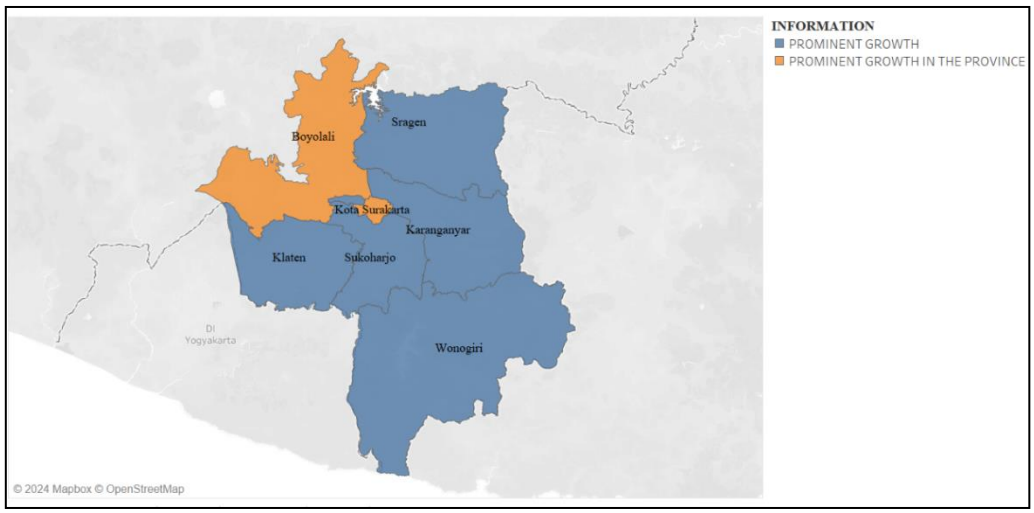

Figure 5 Growth Ratio Model (MRP) Mapping in Solo Raya in 2019-2023

These findings align with growth theories such as Rostow's Stages of Economic Growth, which emphasize the role of infrastructure, labor, and sectoral diversity in sustaining

economic development. The variations also reflect Hirschman's Unbalanced Growth Theory, which posits that regional growth often progresses unevenly due to disparities in resources and investment. Supporting studies, including Setiawan (2023) and Hidayat et al. (2021), emphasize the critical role of identifying superior sectors and implementing targeted policies to enhance regional competitiveness.

Overall, the MRP analysis underscores the importance of addressing disparities across regions through the strategic development of competitive sectors, tailored policies, and improved infrastructure. These measures are essential to fostering inclusive and sustainable economic growth throughout the Solo Raya.

3.3 Overlay Analysis

In considering the results of LQ analysis with the MRP, an overlay analysis can be carried out in the context of the Solo Raya and Central Java Province. Thus, the transformation of the structure of the Solo Raya area can be determined through the mapping presented in Figures 6 and 7.

Based on the overlay analysis in Figures 6 and 7, it can be seen that only the Boyolali district in Solo Raya has undergone significant transformation. In the beginning, the sectors in the region made significant contributions and growth. However, after transforming, these sectors still make a considerable contribution, but the growth becomes small. The slower growth could also be linked to insufficient infrastructure enhancements, which are necessary to sustain and boost the productivity of these sectors. Without continuous infrastructure improvements, such as better transportation networks or digital connectivity, the potential for growth diminishes even if the sectors maintain significant contributions. These findings indicate the existence of dynamics in economic development in line with the research of Nurpita and Khoirudin (2023), which states that infrastructure plays an essential role in facilitating the growth of leading sectors.

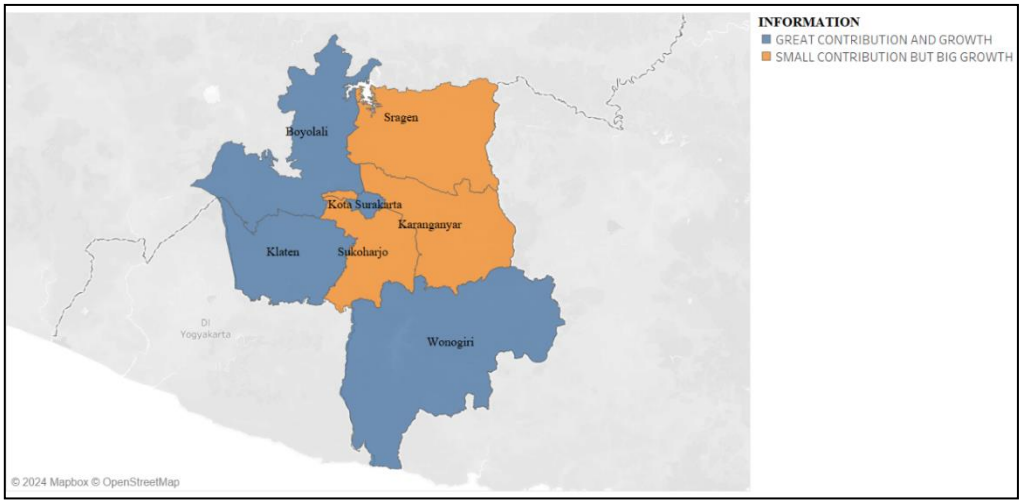

Figure 6 Overlay Analysis Mapping 2014-2018

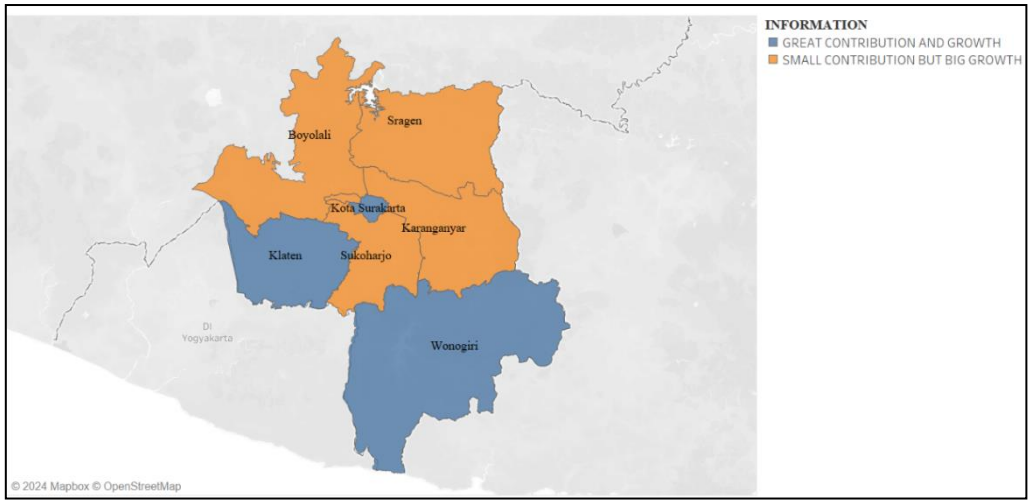

Figure 7 Overlay Analysis Mapping 2019-2023

The non-occurrence of economic structural transformation in Karanganyar, Sragen, and Sukoharjo Regencies during the 2014-2018 and 2019-2023 periods, although their leading sectors made a large contribution, can be caused by several factors. Dependence on certain established sectors without diversifying into new sectors with high growth potential can limit adaptation to economic changes and technological innovations. In addition, challenges such as inadequate infrastructure, limited human resource development, and lack of investment in innovation and productivity improvement can hinder economic transformation in the region.

Similarly, Klaten, Wonogiri, and Surakarta City Regencies which remain in the category of sectors with large contributions and growth reflect the potential for saturation of mature sectors that dominate the economic structure. This could result in slower relative growth as these sectors have reached peak productivity levels without diversification into new emerging industries. In addition, systemic constraints such as bureaucratic barriers, suboptimal policy incentives, or lack of market connectivity are also inhibiting factors.

This result is in line with the findings of Ratnadewati et al. (2024), which show that uneven development in Yogyakarta can pose challenges in making the most of local potential. In this context, the region-based approach emphasized by Saputra et al. (2024) is very relevant to understanding the potential and challenges faced by each region in the Solo Raya. With this approach, more specific and local needs-based strategies, such as infrastructure upgrades, workforce development, and policy incentives that support economic diversification, can be implemented to address economic stagnation and drive a more inclusive transformation.

Overall, the transformation of the economic structure in the Solo Raya area shows a significant shift from the primary sector to the secondary and tertiary sectors. This shift is similar to the findings of Saputra et al. (2024), which analyzed sustainable economic

development in Sukamara Regency, Central Kalimantan. This study shows that the sustainable development of the industrial and service sectors can support inclusive and sustainable economic growth. This study emphasizes the importance of regional development strategies that take into account the superior potential of economic sectors in facilitating economic transformation and encouraging the welfare of people in the region. Furthermore, Fazaa et al. (2023), in their study in the Kedungsepur area, highlighted that inequality in economic growth and the identification of superior sectors need to be addressed with region-based strategies to optimize the potential of superior sectors.

3.4 Policy implications for the government

To strengthen economic development in Solo Raya, the government needs to pay attention to several policy implications based on the findings of this study. First, infrastructure development must be a priority, especially in areas with potential for superior sectors such as the processing industry and financial services. Improving infrastructure, such as transportation and digital connectivity, will drive faster growth and strengthen regional competitiveness. Second, economic diversification needs to be encouraged, especially in regions that still depend on one or two major sectors. This diversification is important to reduce the risk of economic stagnation and create long-term stability. Third, support for investment and adoption of new technologies must be strengthened. High-potential sectors require increased productivity and efficiency through technological innovation, which in turn will create new jobs and strengthen the local economy. Finally, more targeted regional development policies can be carried out by utilizing geospatial data. This approach allows for more specific development planning, tailored to the unique needs and potentials of each region, thus encouraging inclusive and sustainable development.

4. CONCLUSIONS

Based on the results and discussions conducted, it can be concluded that the analysis of LQ and DLQ reveals alterations in the economic sector structure within the Solo Raya. This result is evidenced by the decline and increase in sector transformation in each region in Solo Raya. Furthermore, the processing industry sector and the financial services sector have great potential to be developed in the future to support economic growth throughout the Solo Raya area.

In the MRP analysis, it can be seen that Boyolali Regency transformed economic activities from Category 1 to Category 2. Meanwhile, Sukoharjo and Sragen districts underwent the opposite transformation, namely from category 2 to category 1. While Karanganyar, Klaten, and Wonogiri districts remain in Category 1, and Surakarta City is in Category 2.

The overlay results show that Boyolali Regency has changed from a significant contribution and growth to an immense contribution but small growth. Meanwhile, Karanganyar, Sragen, and Sukoharjo districts did not experience changes in economic structure and still had extensive contribution criteria but small growth. In addition, Klaten,

Wonogiri, and Surakarta Regencies also did not transform and still have significant sector contributions and growth criteria.

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