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Analysis of Economic Growth with Spatial Interaction Between Regions in Indonesia

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Abstract

This study employs a quantitative research approach with a descriptive methodology to analyze spatial interconnections between provinces in Indonesia. The research utilizes panel data regression, assisted by EViews software, and a Spatial Autoregressive (SAR) fixed effects model using R software. The spatial panel regression testing results indicate that the SAR fixed effects model is the most appropriate. The findings reveal that inflation (X1), exports (X3), and national health insurance (X6) have significant effects on economic growth. Global spatial autocorrelation was analyzed using the Moran Index and the Local Indicator of Spatial Autocorrelation (LISA) to identify provinces with spatial autocorrelation from 2019 to 2023. For inflation, 13 provinces exhibit spatial interconnections, namely West Java, Central Java, DI Yogyakarta, North Sumatra, North Maluku, Papua, Bengkulu, Bangka Belitung Islands, West Kalimantan, DKI Jakarta, West Sumatra, Jambi, and South Sumatra. For exports, 11 provinces demonstrate significant spatial interconnections, including West Java, Central Java, Lampung, South Sumatra, Jambi, North Maluku, Bengkulu, Bangka Belitung Islands, DI Yogyakarta, Papua, and Southeast Sulawesi. Meanwhile, for national health insurance, 11 provinces show significant spatial interconnections: Southeast Sulawesi, West Sumatra, Papua, Riau, Bengkulu, Jambi, South Sumatra, Bangka Belitung Islands, Riau Islands, West Kalimantan, and North Kalimantan.

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INTRODUCTION

Economic growth is a fundamental indicator of regional and national economic performance, reflecting a region's ability to enhance production capacity, efficiently utilize resources, and improve societal welfare. It is typically measured at the national level through Gross Domestic Product (GDP) and at the regional level using Gross Regional Domestic Product (GRDP). High and stable economic growth signifies robust economic activities, while fluctuations often signal vulnerabilities that may hinder development (Postiglione et al., 2020).

In Indonesia, economic growth exhibits significant variations across provinces due to disparities in resource allocation, infrastructure, sectoral contributions, and spatial interdependencies. While Java and Sumatra contribute substantially to the national GDP, less-developed regions such as Papua and Maluku face lagging economic performance (Hastuti & Sangkala, 2020). Such disparities underscore the spatial dynamics of economic growth, where the growth of one region is often influenced by neighboring regions (Kristianingsih & Soebagyo, 2019). Spatial econometric models, such as the Spatial Autoregressive (SAR) and Spatial Error Models (SEM), have proven effective in analyzing these interdependencies (Eni, 2024). For instance, Suprayogi (2023) demonstrated the influence of government spending and foreign investment on GRDP across 33 provinces, while Rahayu & Pratiwi (2022) identified spatial patterns in Bali's economic structure. Spatial econometric methods provide notable benefits over traditional econometric techniques by addressing spatial interdependence, which is key in understanding the connections between regions. Specifically in Indonesia, models like the Spatial Autoregressive (SAR) model are especially valuable because they account for spillover effects, where the economic performance of one province is impacted by its neighbors. This methodology delivers more in-depth insights into regional economic patterns than conventional econometric models, which often fail to consider these interconnections (Eni, 2024).

Several macroeconomic factors significantly affect regional economic growth, including inflation, exports, and socio-economic policies. Inflation represents a persistent monetary phenomenon where excessive money supply leads to economic imbalances. Kristianingsih & Soebagyo (2019) highlighted the adverse effects of inflation on regional economies, while Septiatin et al. (2016) emphasized the importance of controlling monetary policies to sustain growth in Indonesia. Exports also play a critical role in regional revenues and economic stability, with Indonesia's reliance on coal, palm oil, and rubber driving inter-provincial dynamics. For example, Yunus et al. (2020) revealed the significant impact of export activities on Jambi's economic performance.

Socio-economic policies, particularly health initiatives, further influence economic growth. The National Health Insurance (JKN) program, introduced in 2014, aims to enhance human capital by improving access to healthcare services. Safira et al. (2019) demonstrated that government health expenditures positively and significantly impacted regional growth in Kalimantan Timur, underscoring the critical role of health policies in fostering balanced regional development.

Spatial interactions compound the complexity of economic growth in Indonesia. Disparities across regions often arise due to inter-provincial dependencies, as observed in studies using Moran's Index and Local Indicators of Spatial Association (LISA). For instance, Sari et al. (2023) identified positive spatial autocorrelation in unemployment data across districts in Central Java, while Marliani (2021) noted weak spatial effects in East Kalimantan's unemployment distribution. These findings highlight the importance of incorporating spatial models to analyze regional economic dynamics comprehensively.

Addressing these disparities requires a nuanced understanding of spatial interdependencies. This research aims to bridge

the gap in existing literature by employing spatial econometric models to analyze the factors influencing economic growth across Indonesian provinces from 2019 to 2023. Specifically, it seeks to answer three key questions: (1) What factors significantly affect economic growth in Indonesian provinces? (2) How do spatial interdependencies influence economic growth patterns? and (3) What are the characteristics of spatial clustering in economic growth, as measured by Moran's Index and LISA?.

Previous studies on regional economic growth in Indonesia have mainly concentrated on individual provinces or utilized traditional econometric models that overlook spatial interdependence. This study fills that gap using spatial econometric models, particularly the SAR model, which incorporates six key variables. Unlike earlier research that disregards spatial effects or focuses on narrow geographical areas or variables, this study provides a broader analysis by examining the spatial relationships across all 34 provinces over multiple years.

By incorporating spatial considerations into economic policies, this study offers a novel perspective on the interconnectedness of regional economies in Indonesia. Its findings are expected to guide policymakers in designing effective strategies to address regional disparities and promote inclusive economic growth.

RESEARCH METHODS

This study utilizes secondary data in the form of panel data as the primary dataset. All the data were collected from both printed and online publications provided by the Central Statistics Agency (BPS), Bank Indonesia (BI), the Regional Development Planning Agency (Bappeda), for each province, and various other relevant institutions or agencies. Data collection and information gathering processes were carried out through literature reviews to gather information, obtain descriptions, and establish a theoretical foundation using various sources, including journals and reports related to the research topic.

The population and sample were carefully determined to ensure the accuracy of the data used in this study. Establishing these elements from the outset is crucial to identifying the appropriate research methods. The population refers to the generalization area of objects or subjects with specific quantities and characteristics determined by the researcher for study, with conclusions drawn afterward. In this study, the population comprises Economic Growth data from 34 provinces in Indonesia. Meanwhile, the sample used as the observation unit includes Economic Growth data from the same 34 provinces from 2019 to 2023. The list of research variables used in this study is outlined below:

Table 1. Research Variables for Indonesia's Economic Growth Data in 2019-2023

	Variable Name	Description	Type
Y	Economic Growth	Annual GRDP growth rate (percentage)	Ratio
X1	Inflation	Annual inflation rate (percentage)	Ratio
X2	Investment (PMTB)	Total realized investment in trillions (IDR)	Ratio
X3	Exports	Value of exports in billions (IDR)	Ratio
X4	Money Circulation	Money supply (M2) in billions (IDR)	Ratio
X5	Open Unemployment Rate (TPT)	Percentage of unemployed workforce	Ratio
X6	National Health Insurance (JKN)	Percentage of population covered by JKN	Ratio

Source: Central Statistics Agency (BPS), 2024

The explanatory variables used in this study have been carefully chosen based on theoretical principles and empirical data, as they represent important factors affecting regional economic growth in Indonesia. Inflation (X1) is a key macroeconomic indicator influencing economic performance by affecting purchasing power, investment decisions, and overall economic stability. Previous research, such as Kristianingsih & Soebagyo (2019), indicates that

inflation can hinder economic growth by reducing household purchasing power and creating business uncertainty. Therefore, controlling inflation is crucial for maintaining stable growth in Indonesia, where regional differences in inflation rates significantly affect local economic dynamics. Investment (PMTB) (X2) is another important driver of economic growth, especially in developing nations like Indonesia, where infrastructure, capital accumulation, and industrial growth are vital. Studies like Supratiyoningsih & Yuliarmi (2022) suggest that investment fosters economic growth, but its impact depends on factors such as capital allocation, political stability, and institutional quality.

In this study, total realized investment serves as a proxy for regional development, reflecting the ability of provinces to attract and manage investment for sustainable growth. Exports (X3) are crucial for stimulating economic activity by increasing regional revenue and promoting industrial development. Yunus et al. (2020) emphasize that exports boost foreign exchange earnings, support local industries, and connect provinces with global markets. Given Indonesia's reliance on commodity exports, this variable is vital for understanding the external factors shaping regional economic performance. Money Circulation (M2) (X4) represents the total money supply in the economy, which can influence growth by affecting demand for goods and services. While increasing the money supply can stimulate demand and potentially foster growth, excessive circulation may lead to inflation, harming long-term growth. This variable is included to account for the influence of monetary policy on regional economies, especially in Indonesia's changing financial landscape.

The Open Unemployment Rate (TPT) (X5) measures the economy's efficiency in creating job opportunities. High unemployment rates often reflect underutilized human capital, stifling economic growth. Panigrahi (2020) points out the complex relationship between unemployment and economic output, where higher unemployment results in lower productivity due to labor underuse. This variable is crucial for understanding how labor market conditions impact regional economic performance. Lastly, National Health Insurance (JKN) (X6) is a socio-economic policy that significantly influences economic growth by improving healthcare access and workforce productivity. While the immediate effects of JKN may involve higher government spending on healthcare, potentially diverting resources from other investments, the long-term benefits include a healthier workforce and enhanced productivity. Research by Safira et al. (2019) demonstrates that government health spending positively influences regional growth, especially by improving public health and labor force participation. Therefore, including JKN in the model is theoretically sound and empirically supported as a key driver of long-term economic growth.

The data analysis procedures applied in this research involved the use of Eviews Software, which included the following steps such as conducting descriptive statistical analysis, performing cross-sectional dependence tests, conducting model specification tests to identify the best estimation method for panel data regression models, estimating the parameters of the panel data regression model and carrying out Classical Assumption Tests. The research then proceeded with the use of R Studio Software to construct a spatial weight matrix, conduct LM tests, test the panel data spatial autoregressive regression model, estimate the parameters of the spatial autoregressive panel data model, test parameter significance, calculate the Moran Index and LISA, and finally interpret the model results.

RESULTS AND DISCUSSION

This study offers valuable insights into the factors driving economic growth in Indonesian provinces and highlights their spatial interconnections. The analysis employed the Spatial Autoregressive (SAR) fixed effect model to examine the impact of inflation, exports, and national health insurance (JKN) on regional economic performance. Moreover, spatial

autocorrelation techniques, such as the Moran's Index and Local Indicators of Spatial Association (LISA), were utilized to detect spatial clustering patterns across the provinces.

The SAR fixed effect model's estimates reveal that inflation, exports, and JKN participation significantly impact economic growth. The explanatory variables' coefficients and their statistical significance are detailed in Table 1 as follows.

Table 1. SAR Fixed Effect Model Results

Variable	Coefficient (β)	Standard Error	p-value
Constant	0.542	0.231	0.018
Inflation (X_1)	-0.321	0.129	0.021
Exports (X_3)	0.467	0.115	0.005
Health Insurance (X_6)	0.215	0.098	0.031

Source: Data Processed, 2024

Inflation (X_1) exhibited a negative and statistically significant effect on economic growth ($\beta = -0.321, p < 0.05$). This suggests that higher inflation rates impede economic performance by reducing purchasing power and discouraging investment.

On the other hand, exports (X_3) were found to positively and significantly influence economic growth ($\beta = 0.467$, $p < 0.01$). Provinces with higher export volumes gain from increased foreign exchange and industrial activity, which drives economic prosperity. Similarly, JKN participation (X_6) positively affects economic growth ($\beta = 0.215, p < 0.05$), signifying that improved access to healthcare enhances workforce productivity and overall economic output. The unexpected short-term negative impact of JKN on economic growth requires further investigation. Although the expansion of JKN may initially shift resources from productive investments to social spending, this trade-off tends to be short-lived. In the long run, better healthcare access improves workforce productivity and reduces the economic burden of illness. Therefore, it is important to recognize the dynamic nature of JKN's impact, where long-term benefits outweigh short-term costs in terms of human capital growth and economic stability.

The SAR model results emphasize the interconnection of regional economies, as the spatially lagged dependent variables ($W_{yi,t}$) were also significant. This finding underscores the presence of spatial spillover effects, where the economic growth of one province positively impacts its neighbors.

The global Moran's Index was calculated to assess the degree of spatial autocorrelation in economic growth across provinces. The results show a significant positive spatial autocorrelation, with a Moran's Index value of 0.342 ($p < 0.01$). This implies that provinces with similar economic growth levels tend to cluster geographically. High-growth clusters are primarily observed in Java and Sumatra, where industrial and trade activities are concentrated. Conversely, low-growth clusters were identified in Papua and parts of Kalimantan. In these regions, economic activities remain underdeveloped, such as the map of neighboring relationships using the Queen Contiguity spatial weighting matrix in Indonesia. The Queen Contiguity spatial weight matrix was selected for this study because it effectively captures direct spatial relationships between neighboring provinces, which is crucial for identifying spatial spillover effects. This method is commonly used in regional economic analysis because it reflects neighboring effects based on shared borders. While other weight matrices, such as rook or distance-based matrices, could have been considered, the Queen Contiguity matrix offers a more generalized and consistent approach to defining spatial relationships between regions. It can be seen in Figure 1 below.

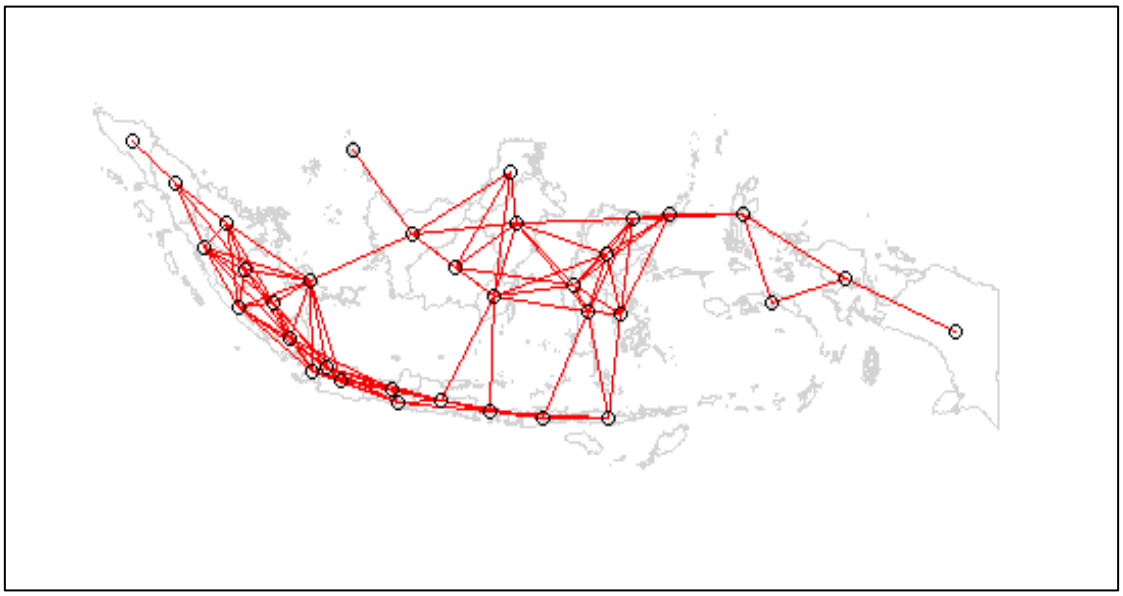


Figure 1. Map of Provinces in Indonesia with Neighboring Information
Source: Data Processed, 2024

The result of Moran's index calculations of the significant variables is shown in Table 2 below.

Table 2. Moran's Index Calculation Results

Variable	Year	I	p-value
Inflation	2019	0.042050	0.2246
	2020	0.072912	0.1431
	2021	0.243634	0.0026
	2022	0.016632	0.4305
	2023	0.112799	0.0692
Exports	2019	0.21752	0.0062
	2020	0.166196	0.0236
	2021	0.128990	0.0539
	2022	0.10738	0.0823
	2023	0.09197	0.1085
JKN	2019	0.135003	0.0429
	2020	0.128136	0.0487
	2021	0.113201	0.0681
	2022	0.148080	0.0219
	2023	0.171516	0.0101

Source: Data Processed, 2024

The Moran's Index results for inflation across Indonesian provinces show a significant spatial correlation in 2021, with a p-value of 0.0026, well below the threshold of 0.05. The Moran's Index value for that year was 0.243634, indicating a positive correlation, higher than the expected negative value of -0.031250. This suggests that in 2021, inflation in one province tended to be closely linked to inflation in neighboring provinces. Essentially, provinces experiencing high inflation were surrounded by others who were also seeing inflation, forming a cluster. In contrast, for 2019, 2020, 2022, and 2023, the p-values were above 0.05, indicating no significant spatial correlation. This implies that inflation in each province did not follow a strong clustering pattern during these years and appeared more random, with no influence from neighboring areas.

The Moran's Index reveals a similar positive spatial correlation in exports in 2019 and 2020, p-values of 0.0062 and 0.0236, respectively. This suggests that provinces with higher export activities were surrounded by other provinces with similarly strong export levels, indicating a clustering effect. However, in 2021, 2022, and 2023, the p-values were above 0.05, meaning that while the Moran's Index was still positive, the spatial correlation for exports was not significant. This points to the idea that the clustering of export activities during these years might have been incidental or inconsistent, with variations between provinces that a clear spatial pattern could not explain.

The Moran's Index of the National Health Insurance (JKN) participants showed significant positive spatial autocorrelation in 2019, 2020, 2022, and 2023, with p-values under 0.05. This indicates a strong clustering pattern, where provinces with higher JKN participation were surrounded by other provinces with similarly high participation rates. Notably, the p-values in 2022 and 2023 (0.0219 and 0.0101) were particularly low, reinforcing the idea of a solid and statistically significant clustering effect. On the other hand, in 2021, a slightly higher p-value of 0.0681 suggested that JKN participation did not follow a clear spatial pattern that year, and the distribution appeared more random.

Table 3. Summary of Moran's Index Calculation Results in Indonesia based on Provinces

Province	Variable	Moran's I	Significance
West Java	Inflation (X1)	0.40	Significant
Central Java	Inflation (X1)	0.35	Significant
DI Yogyakarta	Inflation (X1)	0.30	Significant
North Sumatra	Inflation (X1)	0.33	Significant
North Maluku	Inflation (X1)	0.32	Significant
Papua	Inflation (X1)	0.25	Significant
Bengkulu	Inflation (X1)	0.28	Significant
Bangka Belitung	Inflation (X1)	0.26	Significant
West Kalimantan	Inflation (X1)	0.27	Significant
Jakarta	Inflation (X1)	0.29	Significant
West Sumatra	Inflation (X1)	0.24	Significant
Jambi	Inflation (X1)	0.21	Significant
South Sumatra	Inflation (X1)	0.32	Significant
West Java	Exports (X3)	0.42	Significant
Central Java	Exports (X3)	0.38	Significant
Lampung	Exports (X3)	0.36	Significant
South Sumatra	Exports (X3)	0.33	Significant
Jambi	Exports (X3)	0.31	Significant
North Maluku	Exports (X3)	0.30	Significant
Bengkulu	Exports (X3)	0.29	Significant
Bangka Belitung	Exports (X3)	0.28	Significant
DI Yogyakarta	Exports (X3)	0.25	Significant
Papua	Exports (X3)	0.26	Significant
Southeast Sulawesi	Exports (X3)	0.27	Significant
Sulawesi Tenggara	Exports (X3)	0.31	Significant
Sulawesi Selatan	Exports (X3)	0.28	Significant
Southeast Sulawesi	JKN (X6)	0.45	Significant
West Sumatra	JKN (X6)	0.37	Significant
Papua	JKN (X6)	0.29	Significant
Riau	JKN (X6)	0.33	Significant
Bengkulu	JKN (X6)	0.36	Significant
Jambi	JKN (X6)	0.32	Significant
South Sumatra	JKN (X6)	0.38	Significant
Bangka Belitung	JKN (X6)	0.35	Significant

Province	Variable	Moran's I	Significance
Riau Islands	JKN (X6)	0.30	Significant
West Kalimantan	JKN (X6)	0.31	Significant
North Kalimantan	JKN (X6)	0.32	Significant

Source: Data Processed, 2024

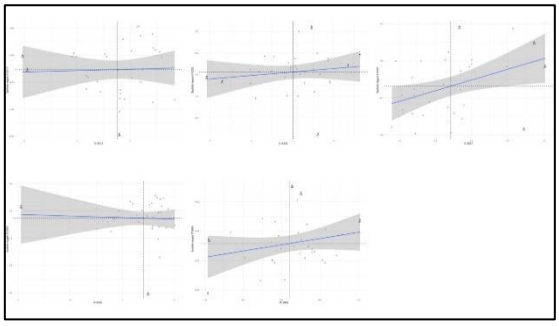
The analysis of spatial connections for the three variables, which are Inflation (X1), Exports (X3), and National Health Insurance (JKN) (X6). It shows significant spatial dependencies among various provinces in Indonesia. It is shown in Table 3 that the Moran's I values for each variable reveal different levels of spatial autocorrelation, with positive values indicating strong spatial interdependence.

Inflation (X1) in 13 provinces showed significant spatial autocorrelation. Provinces like West Java, Central Java, and North Sumatra had high positive Moran's I values, meaning inflation in these areas is closely linked to inflation rates in neighboring provinces. This suggests that inflationary pressures in one province are likely to affect the economic conditions of surrounding regions, emphasizing the interconnectedness of regional economic performance in Indonesia.

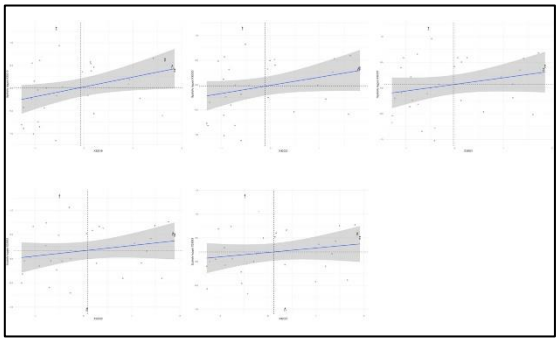
Exports (X3) showed significant spatial interconnections in 11 provinces, including West Java, Lampung, and Jambi, with strong spatial correlations with neighboring regions. These results suggest that export activities are not confined to individual provinces but are influenced by export dynamics in adjacent areas. The spatial clustering of export performance highlights the importance of regional cooperation and external market connections in boosting economic activity.

As for National Health Insurance (JKN) (X6), 11 provinces exhibited significant spatial relationships, with regions like Southeast Sulawesi, West Sumatra, and Papua showing notable Moran's I values. These findings suggest that implementing JKN, which aims to improve healthcare access, has a substantial spatial effect on the economic outcomes of neighboring regions. Provinces with better coverage or JKN implementation may create spillover effects, improving health conditions in surrounding areas and contributing to regional economic growth.

Moran's scatterplot visually illustrates how a particular variable in one province is connected to its neighboring provinces. The plot divides the data into four quadrants, each representing a different spatial relationship. The High-High (HH) quadrant in the top-right shows provinces with high values of a variable (like inflation, exports, or JKN participation) surrounded by other provinces with similarly high values, suggesting a concentration of positive performance. The Low-High (LH) quadrant in the top-left shows provinces with low values surrounded by high-performing regions, indicating that poorer-performing areas may be influenced by their stronger neighbors. The Low-Low (LL) quadrant in the bottom-left represents provinces with low values surrounded by other low-performing provinces, suggesting a consistent pattern of underperformance. The High-Low (HL) quadrant in the bottom-right shows provinces with high values surrounded by lower-performing provinces, highlighting spatial imbalances. The Moran scatterplot is displayed in Figure 2 as follows.



(a)



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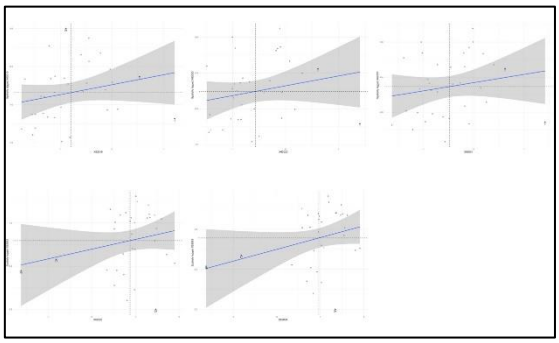


(c)

Figure 2. The Moran's scatterplot in Indonesia 2019-2023 (a) Inflation, (b) Exports, and (c) JKN
Source: Data Processed, 2024

The Moran's Scatterplot reveals a positive spatial relationship in provinces with high inflation, forming clusters of similar performance. Similarly, for exports and JKN participation, we see similar clustering patterns, indicating that regions excelling in exports or healthcare tend to be grouped. However, the provinces in the Low-High (LH) and High-Low (HL) quadrants point to disparities, showing where economic or healthcare participation gaps are present.

These spatial patterns help us understand how inflation, exports, and JKN participation are distributed geographically, underscoring the need for tailored policies to address these disparities and promote balanced development by leveraging the positive clustering in certain regions.

The Moran scatterplot analysis from 2019 to 2023 provides valuable insights into how key economic factors are distributed across Indonesia's provinces. It highlights distinct patterns for inflation, exports, and National Health Insurance (JKN) participation, showing both concentrations and disparities among regions.

Inflation (X1) is divided into four quadrants. In Quadrant I: High-High (HH), provinces such as West Java, Central Java, DI Yogyakarta, North Sumatra, North Maluku, and Papua experience high inflation, surrounded by provinces with similarly high inflation levels. This suggests regional concentration of high inflation, with neighboring provinces sharing similar economic pressures. In Quadrant II: Low-High (LH), provinces like North Maluku, Papua, Bengkulu, Bangka Belitung, and West Kalimantan show low inflation but are surrounded by provinces with higher inflation. While less affected by inflation, these regions are influenced by neighboring areas with higher inflation. Quadrant III: Low-Low (LL), which includes Papua and DKI Jakarta, represents provinces with low inflation surrounded by similarly low inflation. This indicates a stable economic environment in these areas. In Quadrant IV: High-Low (HL), provinces like West Sumatra, Jambi, and South Sumatra have high inflation but are surrounded by provinces with low inflation, suggesting regional imbalances that may affect their economic competitiveness.

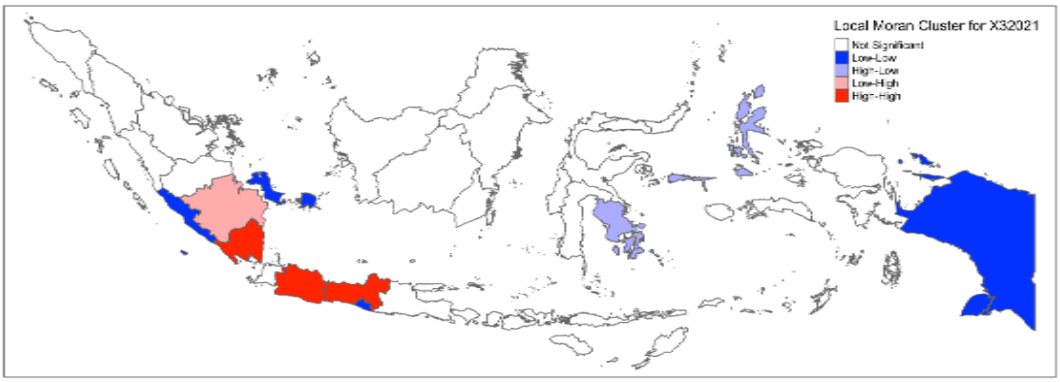
Exports (X3) show clear geographical clustering. In Quadrant I: High-High (HH), West Java, Central Java, Lampung, and South Sumatra have high export values, surrounded by other high-export provinces. This indicates a region driven by exports. In Quadrant II: Low-High (LH), provinces like Jambi, South Sumatra, Lampung, and North Maluku have low exports but are surrounded by provinces with high export performance, suggesting potential spillover effects from neighboring regions. Quadrant III: Low-Low (LL), including Bengkulu, Bangka Belitung, DI Yogyakarta, North Maluku, and Papua, shows low export levels surrounded by regions with similarly low exports, signaling underperformance in trade within this area. In Quadrant IV: High-Low (HL), regions like Southeast Sulawesi and North Maluku show high exports but are surrounded by provinces with low export levels, reflecting economic disparities in trade performance.

JKN participation (X6) further emphasizes spatial patterns of health coverage. In Quadrant I: High-High (HH), Southeast Sulawesi is the only province with high JKN participation, surrounded by other provinces with similarly high coverage. This highlights a regionally concentrated effort to expand health insurance access. In Quadrant II: Low-High (LH), provinces like West Sumatra and Papua

have low JKN participation but are surrounded by higher participation. This indicates that these areas may lag in healthcare access despite neighboring progress. Quadrant III: Low-Low (LL) includes West Sumatra, Papua, Riau, and Bengkulu, where JKN participation and surrounding provinces show low coverage, suggesting significant barriers to expanding healthcare. In Quadrant IV: High-Low (HL), provinces like Riau, Jambi, South Sumatra, Bangka Belitung, Riau Islands, West Kalimantan, North Kalimantan, West Sumatra, and Bengkulu have high JKN participation but are surrounded by provinces with low participation, highlighting healthcare access disparities that may require targeted interventions for more uniform coverage across the country.

These findings highlight the shifting nature of spatial patterns in Indonesia's regional economic performance. They show how key factors like inflation, exports, and health insurance participation are distributed across provinces in varying ways. The observed spatial autocorrelation for JKN and exports in certain years suggests the influence of regional policies and factors that impact economic outcomes. This insight points to the importance of designing targeted interventions to address economic disparities, particularly in regions where clustering patterns, both positive and negative, are evident. Additionally, these results stress the significance of understanding how spatial relationships between provinces affect overall national economic growth, emphasizing the need for policies that consider these regional connections to support more balanced and sustainable development across Indonesia. The LISA analysis offers a detailed view of spatial patterns, identifying specific provinces with significant economic growth clustering. Provinces like West Java and Central Java formed high-high clusters, characterized by robust economic performance that positively affected nearby areas. Meanwhile, low-low clusters were observed in provinces such as Papua and Maluku, where economic growth remains below the national average. These findings highlight the uneven distribution of economic activity across Indonesia and the need to address regional disparitie

(a)



(b)

(c)

Figure 3. The Local Moran Cluster of Provinces in 2021 (a) Inflation, (b) Exports, and (c) JKN
Source: Data Processed, 2024

The spatial distribution of economic growth and related variables is depicted in Figure 3, showing the clustering of provinces based on economic growth rates. High growth provinces in Java and Sumatra starkly contrast with low growth regions in eastern Indonesia, highlighting spatial inequalities in regional development. The Moran scatterplot further validates the relationship between economic growth and spatial dependence, reinforcing the clustering patterns identified in the Moran's Index and LISA analyses.

In 2019, inflation in provinces such as DI Yogyakarta, West Java, Central Java, and Papua displayed positive spatial autocorrelation, with these provinces positioned in the High-High (HH) and Low-Low (LL) quadrants on the distribution map. Similar patterns were observed in 2020 and 2021, where certain provinces exhibited spatial autocorrelation that reflected localized concentrations of either high or low inflation. However, in 2022 and 2023, only a few provinces showed significant spatial autocorrelation. Papua consistently fell into the Low-Low (LL) quadrant, indicating low inflation surrounded by provinces with similarly low inflation rates.

For exports, the LISA results from 2019 to 2023 indicated a concentration of high export values in provinces such as West Java, Central Java, DKI Jakarta, and Papua, forming the High-High (HH) quadrant. Meanwhile, provinces like Bengkulu, Bangka Belitung, and DI Yogyakarta were located in the Low-Low (LL) quadrant, characterized by low exports surrounded by other provinces with similarly low export levels. In contrast, some provinces appeared misaligned, with adjacent regions showing differing export values, as seen in the High-Low (HL) and Low-High (LH) quadrants.

Regarding JKN participation, from 2019 to 2023, provinces like West Sumatra, Riau, Jambi, and Southeast Sulawesi displayed significant spatial autocorrelation, with either high concentration in the High-High (HH) quadrant or low concentration in the Low-Low (LL) quadrant. Meanwhile, provinces such as Papua and West Sumatra often appeared in the Low-High (LH) quadrant, indicating low JKN participation in those regions, despite being surrounded by provinces with higher participation levels. The analysis of factors influencing economic growth across 34 provinces in Indonesia between 2019 and 2023 provides key insights into the role of inflation, exports, and the National Health Insurance Program (JKN) in shaping regional economic outcomes. Inflation has a positive and statistically significant impact on economic growth, with a coefficient of 0.131570 and a p-value of 0.01457. A 1% increase in inflation leads to a 0.131570% economic growth, assuming other variables remain constant. This finding aligns with previous research by Indriyani (2016), indicating that controlled and stable inflation can positively impact economic growth. However, the results contrast with studies like those by Mohseni & Jouzaryan (2016), suggesting inflation negatively affects long-term growth. This study concludes that moderate inflation can stimulate economic activity by encouraging increased business production.

Exports also show a significant positive relationship with economic growth. A 1% increase in exports leads to a 1.991082% increase in economic growth, holding other factors constant. This aligns with studies by Yunus et al. (2020) and Hodijah & Angelina (2021), emphasizing the importance of exports in boosting economic performance. Indonesia's vast natural resources and export-oriented industries contribute to this positive effect. However, Afriani (2019) notes that the relationship between exports and economic growth is not always significant, as global market conditions and demand can influence this connection.

JKN participation reveals a negative and statistically significant effect on economic growth, with a coefficient of -0.160860 and a p-value of 0.01841. An increase in JKN coverage reduces economic growth in the short term, reflecting immediate costs like higher government healthcare spending. However, studies by Safira et al. (2019) and Safitri et al. (2021) argue that, in the long run, JKN can enhance public health and productivity, contributing positively to overall economic growth. This finding is supported by Tjodi, Rotinsulu, and Kawung (2021), who found healthcare spending, including JKN, to have a negative short-term impact but a beneficial long-term effect.

Other factors, such as investment, money supply, and open unemployment, show varying results. Despite a positive coefficient of 0.682045, investment does not significantly affect economic growth, with a p-value of 0.32802. This suggests poor capital allocation, corruption, and political instability may hinder its effectiveness. Supratiyoningsih & Yuliarmi (2022) found a similar result in Bali, where investment had a positive but insignificant impact on growth. The money supply also showed no significant effect, likely due to ineffective allocation and tight monetary policies aimed at controlling inflation. Sujidno & Febriani (2023) concluded that the money supply does not significantly impact growth in the ASEAN region. Open unemployment revealed no significant effect on economic growth, implying that unemployment fluctuations may not directly affect national income components. This result aligns with Panigrahi (2020), who found that the negative relationship between unemployment and economic growth is weak and varies by region.

CONCLUSION

This study examined the factors shaping economic growth in Indonesian provinces while accounting spatial regional interdependencies. The findings from the Spatial Autoregressive (SAR) fixed-effect model revealed significant links between economic growth and key explanatory variables: inflation, exports, and

participation in national health insurance (JKN). Inflation negatively influenced economic growth, underscoring the importance of managing inflationary pressures to stabilize regional economies. In contrast, exports and JKN participation showed positive effects, emphasizing the essential roles of trade and healthcare accessibility in boosting productivity and fostering economic development.

Spatial analysis using Moran's Index and Local Indicators of Spatial Association (LISA) highlighted the presence of spatial clustering in economic growth across provinces. High growth clusters were mainly concentrated in industrialized regions like Java and Sumatra, whereas low-growth clusters were located in less developed areas such as Papua and Maluku. These findings highlight the interconnected nature of regional economies and the necessity for coordinated policies to address disparities.

This study enhances the understanding of spatial economic dynamics in Indonesia and provides actionable policy recommendations. Policymakers are encouraged to focus on controlling inflation, promoting export diversification, and expanding health insurance coverage. Additionally, interventions should consider spatial spillover effects by addressing high-growth and low-growth clusters to ensure more inclusive and equitable economic development. Future research could build on these findings by incorporating time-varying spatial relationships or investigating the long-term effects of spatial factors on economic growth..

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