Analysis of Causality and Spillover Effects of Balikpapan's Economic Growth on the Economic Growth of North Penajam Paser and Kutai Kartanegara Regencies

Wilisius Febrianus Alexan Nosar[1] and Emmilya Umma Aziza Gaffar[2*]

[1,2] Department of Economics, Faculty of Economics and Business, Mulawarman University, Kuaro Street, Samarinda 75119, East Kalimantan, Indonesia
*Corresponding author's e-mail: emmilya.gaffars@gmail.com

Abstract. Interegional economic growth does not occur evenly and is often shaped by the existence of growth pole that has strong leading sectors. Balikpapan City serves as a growth pole in East Kalimantan, with the potential to generate spillover effects for its surrounding areas, specifically North Penajam Paser Regency and Kutai Kartanegara Regency as its hinterlands. This study aims to analyze the causality and spillover effects of economic growth between Balikpapan City and the regencies of North Penajam Paser and Kutai Kartanegara. This research employs secondary time-series data spanning from 2011 to 2024, including the economic growth rates based on 2010 Constant Market Prices, sourced from the publication of the Central Bureau of Statistics of Balikpapan City, North Penajam Paser Regency, and Kutai Kartanegara Regency. This research utilizes two main analytical methods: the Granger Causality Test and the Vector Error Correction Model. The results indicate a unidirectional causal relationship between the economic growth of Balikpapan City and North Penajam Paser Regency. Conversely, there is a bidirectional causal relationship exists between the economic growth of Balikpapan City and Kutai Kartanegara Regency. Balikpapan City provides a spillover effect in the form of a spread effect toward both North Penajam Paser and Kutai Kartanegara. However, the economic growth of North Penajam Paser and Kutai Kartanegara has not been adequate to considerably influence the economic growth of Balikpapan City.

Keywords: Economic Growth, Growth Pole, Causality, Spillover Effect.

1 Introduction

Economic growth is a long term macroeconomic issue where a region and its society strive to increase their capacity to produce goods and services. Economic growth becomes an important objective in a region's economy because it has implications for various other aspects [1]. One policy to enhance economic growth is through spatial-based regional development. A growth pole serves as one approach to stimulate and accelerate growth in order to improve societal welfare. A growth pole is described as a

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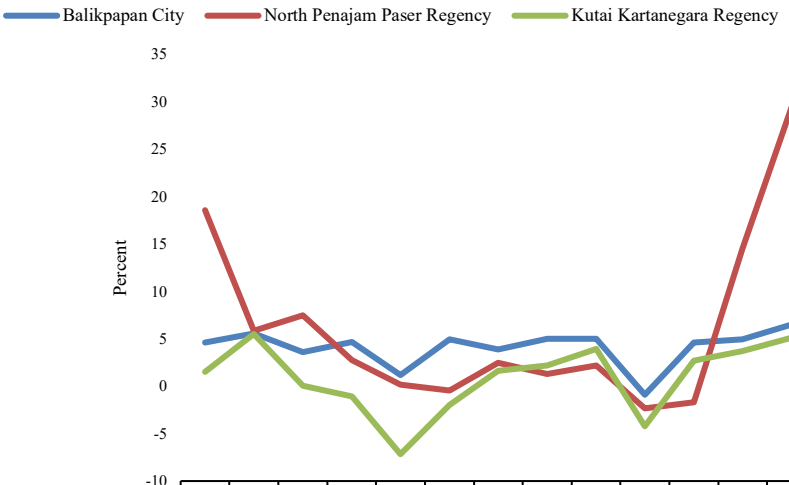
location with abundant facilities and conveniences, making it a pole of attraction that encourages various economic activities to concentrate in that area. The criteria for a growth pole include having internal linkage among various economic activities, the existence of a multiplier effect, geographical concentration, and the capacity to stimulate its surrounding hinterland [2].

Economic dynamics within a growth pole in the long run will generate spillover effects on surrounding regions, with varying degrees of intensity [3]. A spillover effect refers to a condition in which a region, through its various economic activities, successfully generates a significant volume of growth spillovers that are capable of stimulating economic growth in surrounding areas. In addition to producing a spread effect, which distributes resources outward, the dynamics of a growth pole may also create negative impacts in the form of resource drainage from surrounding regions, known as the backwash effect [4]. Economic activities concentrated within a growth pole will benefit surrounding regions if accompanied by technology transfer, intersectoral linkages, and sustained economic growth. Conversely, in the absence of such factors, excessive resource migration may occur, depleting resources from the periphery without generating the necessary feedback to stimulate the surrounding areas. According to Perroux, the interconnection between regions, both economically and geographically, can have a positive impact on regional economic growth. However, Myrdal argues that under certain conditions, such relationships can lead to spatial disparities if one of the interacting regions exhibits dominance.

Regional Spatial Planning (RTRW) zones refer to the spatial division of an area used to determine policy directions and strategies for spatial utilization. In the RTRW document, each zone is further detailed with zoning maps. Based on the East Kalimantan Provincial Regulation Number 1 of 2016 concerning the Regional Spatial Plan of East Kalimantan Province for 2016 to 2036 [5], Balikpapan City is designated as a National Activity Center (PKN), which is a concept in Indonesia's spatial planning referring to strategic urban areas designated to serve as primary hubs for economic, commercial, and governmental activities. PKN functions to concentrate strategic economic activities such as trade, industry, and services, thereby encouraging investment and creating employment opportunities. North Penajam Paser Regency is designated as a Promotional Regional Activity Center (PKWp), intended to serve as a center for the development of agriculture, plantations, and fisheries, acting as a supplier and buffer for food needs in surrounding areas, including Balikpapan City. Several areas within Kutai Kartanegara Regency are designated as Local Activity Centers (PKL), functioning as centers that support the activities of Balikpapan City as a PKN and as growth pole for the surrounding villages.

Balikpapan City is administratively adjacent to North Penajam Paser Regency to the south and Kutai Kartanegara Regency to the north. This closeness allows Balikpapan City to assume a strategic position in interregional linkage and serve as a gateway to external regions via transportation modes and infrastructure, facilitating the seamless mobility of goods, services, and labor. The areas of Balikpapan City, North Penajam Paser Regency, and Kutai Kartanegara Regency have considerable resource potential and should be able to form interdependent relationship in their economic activities. As

neighboring administrative jurisdictions, these regions exhibit relatively comparable economic growth, as shown in the graph below.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Balikpapan City	4.6	5.57	3.6	4.64	1.19	4.92	3.84	4.97	4.99	-0.91	4.57	4.96	6.49	3.23
North Penajam Paser Regency	18.53	5.85	7.46	2.76	0.14	-0.47	2.44	1.28	2.16	-2.34	-1.69	14.49	29.4	30.68
Kutai Kartanegara Regency	1.52	5.49	0.04	-1.08	-7.17	-1.97	1.63	2.16	3.92	-4.21	2.68	3.7	5.13	5.62

Fig. 1. Economic Growth Rates

Source: BPS (2024)

Based on the graph above, the fluctuations in Balikpapan City's economic growth are certainly inseparable from the economic growth conditions of the surrounding regencies. In general, Balikpapan City's economic activity can reflect the economic conditions of North Penajam Paser Regency and Kutai Kartanegara Regency. Variations in economic growth values across regions occur because each region possesses different comparative advantages, such as differences in the availability of natural resources, production factors, service sectors, supporting infrastructure, and human resources.

Literature [6] conducted a study on the spillover effects of economic growth among regencies/municipalities in the PURWOMANGGUNG Area of Central Java and found that the economic growth relationships among regions in PURWOMANGGUNG were mostly bidirectional, meaning that each region was able both to generate and receive economic growth impacts from other regions. The spillover effects of economic growth varied across regions, with the spread effect in the economic activities of the PURWOMANGGUNG Area being greater than the backwash effect. Literature [7] conducted a study on the economic growth among Kotamobagu City, Bolaang Mongondow Regency, and East Bolaang Mongondow Regency and found that the economic growth interregion is bidirectional, producing positive spillover effects for each region. This causal relationship and positive spillover are determined not only by leading sectors and government trade policies but also by spatial conditions and infrastructure.

Empirical studies on the spillover effects of economic growth are crucial, considering that the implementation of growth poles across various regions still generates debates regarding the balance between growth and equity. Therefore, it is necessary to understand the interrelationships within regional economies that subsequently generate spillover effects on regional economic growth. This study has several research questions, namely: how is the causal relationship of economic growth between Balikpapan City and North Penajam Paser Regency, how is the causal relationship of economic growth between Balikpapan City and Kutai Kartanegara Regency, how is the spillover effect of economic growth between Balikpapan City and North Penajam Paser Regency, and how is the spillover effect of economic growth between Balikpapan City and Kutai Kartanegara Regency.

2 Literature Review

Economic growth reflects the economic activities of a region in generating added value within a specific period. High and sustainable economic growth is a fundamental condition and a necessity for the continuity of economic development and the improvement of regional welfare [8]. Quality economic growth is growth that creates income equality, poverty reduction, and broad employment opportunities. Economic growth can be considered of high quality when a region experiences an increase in economic growth accompanied by equitable income distribution, thereby ensuring fair distribution of development outcomes across all areas and reducing poverty levels [9]. According to George Bort, based on his analysis rooted in neoclassical economic theory, a region's economic growth greatly benefits from its ability to enhance production activities. However, production activities in a region are not solely determined by its internal potential but are also influenced by labor mobility and capital mobility between regions, especially neighboring ones.

A growth pole is an approach in regional development planning that emphasizes the role of specific economic centers in driving economic growth and development across the entire region [10]. The creation of growth poles contributes to addressing issues such as the development of underdeveloped areas by establishing industries and spatial economic structures, increasing investment attractiveness, developing knowledge-intensive industries, and minimizing transportation and other costs [11]. Fundamentally, a growth pole is a region and its internal space that can support the livelihood of its population and influence the growth and development of surrounding areas [12]. According to Hirschman, the implementation of growth poles must be followed by a trickle-down effect and a spread effect through synchronized activities between the growth center and the resource base in rural areas.

The concept of the spillover effect defined as externalities arising from specific activities that influence economic actions within a region is inherently integrated into the formation of growth poles [13]. The growth spillover effect implies that the economic growth of a particular area will affect the economic growth of its neighboring regions; conversely, an area's economic growth is also driven by the growth of its surrounding regions [6]. Fingleton demonstrates that the occurrence of spillovers can increase

spatial dependence regarding a region's growth. The overflow of economic activities from one area whether through the mobility of goods, labor, and capital or via spatial externalities can influence the economic activities of a specific region within a given space [14]. Capello identifies three types of spillover effects: knowledge spillovers, industrial spillovers, and growth spillovers. According to Capello, production growth in an area's economic sector can be significantly influenced by the accelerated economic growth of its surrounding regions [15].

Causality is a fundamental concept that describes a cause–effect relationship, in which one event (the cause) leads to another event (the effect). Causality is also used to understand how one variable may be related to another. It not only indicates the existence of a relationship between variables but also identifies which variable acts as the cause and which one serves as the effect. A causality test involves past data, based on the assumption that all past changes are the causes of whatever occurs in the present (predictive causality) [16].

The Vector Error Correction Model (VECM) concept was developed by Johansen and Juselius. VECM offers a straightforward procedure for separating long run components from short run components. It is a combined and extended model of the Error Correction Model (ECM) and the Vector Autoregressive (VAR) model. VECM incorporates limited cointegration information in its specification, which is why it is often referred to as a VAR framework for non stationary series with cointegration relationships [17].

3 Methodology

This study employs a descriptive quantitative method focused on solving research issues via the phases of data gathering, structuring, processing, analyzing, interpreting, and concluding to comprehend the relationships between variables. This research employs secondary time-series data spanning from 2011 to 2024, including the economic growth rates of Balikpapan City, North Penajam Paser Regency, and Kutai Kartanegara Regency. This period was selected based on the availability of consistent data and its relevance in reflecting economic dynamics following the designation of Balikpapan as a National Activity Center (PKN).

Data collection was conducted through literature reviews and publications obtained from Statistics Indonesia (BPS) and other government agencies. This study aims to examine the causal relationships and spillover effects of Balikpapan's economic growth on North Penajam Paser and Kutai Kartanegara Regencies. This research utilizes two main analytical methods: the Granger Causality Test and the Vector Error Correction Model (VECM). Data processing is performed using EViews 13 software to achieve the analytical objectives. The significance level used in this study is 10% (or 0.10), given the relatively small sample size and the high level of data variation.

The Granger Causality Test is used to determine the existence of causality relationships in economic growth between regions. Causality exhibits three patterns: unidirectional causality, where the causal direction is found from variable X to Y or vice versa (from Y to X); and bidirectional causality, which signifies that variables X and Y have

a mutual or reciprocal relationship [18]. Furthermore, the result of the causality test may indicate independence, which occurs when there is no causal relationship between the variables [19]. The Granger Causality equations are as follows.

$$Y_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + \epsilon_{1t} \quad (1)$$

$$X_t = \sum_{i=1}^{n} \lambda_i X_{t-i} + \sum_{j=1}^{n} \delta_j Y_{t-j} + \epsilon_{2t} \quad (2)$$

Where:

Y_t	: economic growth of region i in year t
X_t	: economic growth of region j in year t
Y_{t-i}	: economic growth of region i in year $t-i$
X_{t-i}	: economic growth of region j in year $t-i$
Σ	: The summation from the 1st lag to the n −th lag
n	: number of lags
$\alpha, \beta, \lambda, \delta$	: regression coefficient
ϵ_t	: eror term

The Vector Error Correction Model (VECM) is used to determine the impact of economic growth in one region on other regions. Before estimating the VECM, several preliminary tests must be conducted. The initial step in model development is to perform a stationarity test. If the data are stationary at the level, the appropriate model is the standard Vector Autoregressive (VAR) model (unrestricted VAR) [17]. If the data are not stationary at the level but become stationary after differencing, it is necessary to test whether a long term relationship exists by conducting a cointegration test. If cointegration is present, the VECM model is used. If the data are stationary after differencing but the variables are not cointegrated, the appropriate model is a VAR in difference. The specification of the model used in this study is formulated as follows.

$$\Delta Y_t = \mu_{0x} + \mu_{1x} t + \Pi_x Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_{ix} \Delta Y_t + \varepsilon_t \quad (3)$$

Where:

Y_t	: vector of variables
μ_{0x}	: intercept vector
μ_{1x}	: regression coefficient vector
t	: time trend
Π_x	: cointegration equation containing long-run relationships
Y_{t-1}	: variable in levels
Γk	: regression coefficient matrix
$k-1$	: VECM order of the VAR
ε_t	: eror term

4 Results and Discussion

4.1 The results

This study was conducted through several stages of statistical testing, namely the unit root test (stationarity), determination of the optimal lag length, determining the f-table value, granger causality test, cointegration testing, determining the t-table value, and the vector error correction model. This series of tests was carried out to ensure that both the short run and long run relationships among the economic growth of the three regions can be analyzed validly.

Table 1. Unit Root Test at the Level

Variable	Level		Results
	ADF Stat.	Prob.	
EG. BPP	-0.768532	0.3620	Not stationary
EG. PPU	-0.165555	0.6058	Not stasionary
EG. KKN	-2.094711	0.0391	Stasionary

Based on the table above, it can be observed that out of the three research variables, two variables still contain a unit root or are not stationary at the level, as indicated by probability values greater than the 10% (0.10) significance level. These variables are the economic growth of Balikpapan City (EG. BPP), with a probability value of 0.3620, and the economic growth of North Penajam Paser Regency (EG. PPU), with a probability value of 0.6058. Meanwhile, the economic growth of Kutai Kartanegara Regency (EG. KKN) is already stationary at the level, as shown by its probability value of 0.0391, which is lower than the significance level.

Table 2. Unit Root Test at the First Difference

Variable	First Difference		Results
	ADF Stat.	Prob.	
EG. BPP	-6.139867	0.0000	Stationary
EG. PPU	-3.416685	0.0036	Stasionary
EG. KKN	-4.837626	0.0002	Stasionary

Based on the table above, it can be seen that all research variables do not contain a unit root, or in other words, the data have become stationary at the first difference level, as indicated by probability values lower than the 10% (0.10) significance level for each variable. Thus, the initial statistical requirements have been fulfilled, and the analysis can proceed to the next testing stage.

The determination of the lag length is conducted to identify the optimum lag that will be used in the subsequent analysis. This step is important because the estimation of causal relationships is highly sensitive to the selected lag length. The optimum lag is the lag order that provides a significant influence, which requires examining the data

and determining the most appropriate lag structure. If the chosen lag is too small, it may fail to capture the full dynamics of the variables and lead to incomplete model specification.

Table 3. Determination of the Optimum Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-86.93738	NA*	2540.535*	16.35225	16.46077*	16.28385
1	-82.58632	5.537714	6558.277	17.19751	17.63158	16.92389
2	-67.40511	11.04088	3843.259	16.07366	16.83328	15.59482*
3	896.3563	0.000000	NA	-173.2713*	-172.3635*	-174.2671*

Based on the table above, it can be seen that the smallest AIC value is found at lag 3. Thus, the optimal influence of the variables on one another occurs within a span of 3 periods. This indicates that lag 3 is the ideal lag for the estimation process.

The F-table is a table containing the critical values of the F (Fisher-Snedecor) distribution used in statistical testing. The F-table value serves as a benchmark for comparing the calculated F-value (F-statistic) obtained from data analysis. In this study, the F-table value was determined using a significance level of 10% (0.10), due to the relatively small amount of data and its high variability. The numerator degrees of freedom (Df_1) obtained is 2, while the denominator degrees of freedom (Df_2) is 11. Based on the F distribution table, the resulting F-table value is 2.8595.

Table 4. Granger Causality Test between Balikpapan City and North Penajam Paser Regency

Null Hypothesis	Obs	F-Stat.	Prob.
EG. PPU Does not Granger Cause EG. BPP	10	1.45690	0.3823
EG. BPP Granger Causes EG. PPU		5.84379	0.0905

Based on the results above, it can be seen that the EG. PPU does not cause changes in the EG. BPP. This is indicated by the probability value of 0.3823, which is greater than the 10% (0.10) significance level, and an F-statistic value of 1.45690, which is lower than the F-table value. In addition, it is also known that the EG. BPP causes changes in the EG. PPU. This is indicated by the probability value of 0.0905, which is lower than the significance level, and an F-statistic value of 5.84379, which is higher than the F-table value.

Table 5. Granger Causality Test between Balikpapan City and Kutai Kartanegara Regency

Null Hypothesis	Obs	F-Stat.	Prob.
EG. KKN Does not Granger Cause EG. BPP	10	7.31401	0.0682
EG. BPP Granger Causes EG. KKN		8.62426	0.0551

Based on the results in the table above, it can be seen that the EG. KKN causes changes in the EG. BPP. This is indicated by the probability value of 0.0682, which is lower than the 10% (0.10) significance level, and the F-statistic value of 7.31401, which is higher than the F-table value. It is also known that the EG. BPP causes changes in

the EG. KKN. This is indicated by the probability value of 0.0551, which is lower than its significance level, and the F-statistic value of 8.62426, which is higher than the F-table value.

Table 6. Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,1 Critical Value	Prob.** Critical Value
None *	0.910103	39.3284	32.06455	0.0162
At most 1	0.590532	12.82841	16.16088	0.2519
At most 2 *	0.239153	3.006554	2.70555	0.0829

Based on the results in the table above, the trace statistic at at most 2 is 3.006554, which is greater than the critical value of 2.70555 at the 10% significance level. Thus, it can be concluded that there are two cointegrating relationships among the variables, indicating the presence of long term relationships. Therefore, the analysis can be continued using the VECM method.

The t-table is a table containing the critical values of the t-student distribution, which is used as a reference in statistical hypothesis testing, particularly when the sample size is small ($n < 30$) or the population variance is unknown. The t-table is used to compare the t-statistic obtained from the analysis in order to determine whether a coefficient is statistically significant or not. In this study, the t-table value was determined using a significance level (probability) of 10% (0,10), due to the relatively small amount of data and its high variability. The degrees of freedom obtained were 11. Therefore, the t-table value taken from the two tailed t-student distribution table is 1.79588.

Table 7. Vector Error Correction Model

Error Correction	EG. BPP	EG. PPU	EG. KKN
COINTEQ1	-3.63628	-9.272966	-3.091563
	(2.03217)	(2.77893)	(3.24042)
	[-1.78936]	[-3.33688]	[-0.95406]
COINTEQ2	0.473169	1.152765	0.449644
	(0.23685)	(0.32388)	(0.27453)
	[1.99777]	[3.55920]	[1.63786]
EG. BPP (-1)	0.871139	2.76369	2.327193
	(0.91202)	(1.24716)	(1.24623)
	[0.95517]	[2.21598]	[1.86738]
EG. PPU (-1)	-0.348099	-2.04394	-0.292238
	(0.25231)	(0.34502)	(0.40232)
	[-1.37966]	[-5.92407]	[-0.72638]
EG. KKN (-1)	0.02613	0.920359	-0.131153

	(0.45502)	(0.62223)	(0.72556)
	[0.05743]	[1.47914]	[-0.18076]
C	0.221941	1.571296	0.764185
	(-1.07168)	(-1.46549)	(-1.70886)
	[0.20710]	[1.07220]	[0.44719]

Based on the long term estimation results, the error correction term COINTEQ1 in the EG. PPU equation has a t-statistic value of -3.33688, which is greater in absolute terms than the t-table value. This indicates that in the long run, any deviation from equilibrium will be corrected by EG. PPU in the opposite direction. The t-statistic values of COINTEQ1 in the EG. BPP equation (-1.78936) and the EG. KKN equation (-0.95406) show that the first cointegration vector does not have a significant long term effect on changes in EG. BPP or EG. KKN, meaning that no strong adjustment process toward long term disequilibrium occurs for these two variables.

For the COINTEQ2 component, the t-statistic values are 1.99777 in the EG. BPP equation and 3.55920 in the EG. PPU equation. Both values exceed the critical t-table value in absolute terms. This indicates that in the long run, EG. BPP and EG. PPU have a directional relationship with the second cointegration vector, where increases in one variable in the previous period will be followed by increases in the other variable in the subsequent period. Meanwhile, the t-statistic value of COINTEQ2 in the EG. KKN equation is 1.63786, which is lower than the critical t-table value. This shows that in the long run, the second cointegration vector does not have a significant effect on changes in EG. KKN, indicating that no strong adjustment process toward long-term disequilibrium occurs for this variable.

Based on the VECM results in Table 7, short run relationships were identified between the economic growth of Balikpapan City and the economic growth of North Penajam Paser Regency. In the short run equation, the variable EG. BPP (-1) shows an absolute t-statistic value of 2.21598 in the EG. PPU equation, which is greater than the t-table value. This indicates that changes in EG. BPP in the previous period have a significant and positive effect on changes in EG. PPU in the following period. Meanwhile, the variable EG. PPU (-1) shows an absolute t-statistic value of -1.37966 in the EG. BPP equation, which is lower than the t-table value, indicating that changes in EG. PPU in the previous period do not have a significant effect on changes in EG. BPP in the subsequent period.

Short run relationships were identified between the economic growth of Balikpapan City and the economic growth of Kutai Kartanegara Regency. The variable EG. BPP (-1) also shows an absolute t-statistic value of 1.86737 in the EG. KKN equation, which is greater than the t-table value. This indicates that changes in EG. BPP in the previous period have a significant and positive effect on changes in EG. KKN in the next period. In contrast, the variable EG. KKN (-1) shows an absolute t-statistic value of 0.05743 in the EG. BPP equation, which is lower than the t-table value, indicating that changes in EG. KKN in the previous period do not have a significant effect on changes in EG. BPP in the following period.

4.2 Discussion

Causality

The mapping of causality directions serves as a fundamental basis for examining the economic growth relationships between regions and determining the extent to which the resulting growth patterns reflect the characteristics of a growth pole. These findings also provide a strong analytical foundation for understanding the mechanisms of economic growth diffusion within the East Kalimantan region. The interregional pattern of causality relationships of economic growth in this study can be visualized as follows.

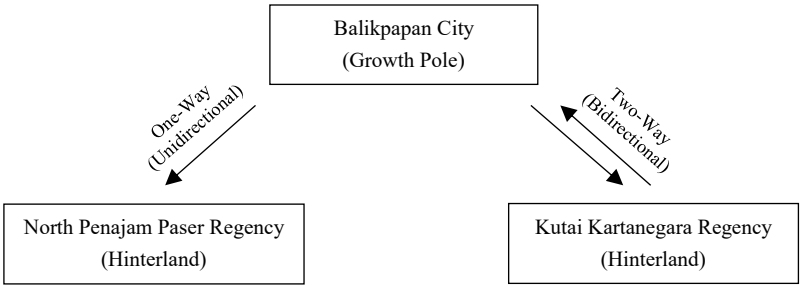


Fig. 2. Interregional Causality Directions

The direction of causality shows different patterns for each region. The relationship between Balikpapan City and North Penajam Paser Regency is unidirectional, as the economic growth of Balikpapan City can influance the economic dynamics of North Penajam Paser Regency, however, the economic growth of North Penajam Paser has not yet been able to drive the economic growth of Balikpapan City. The relationship between Balikpapan City and Kutai Kartanegara Regency exhibits a bidirectional or reciprocal pattern, although the influence is still dominated by Balikpapan. This trend verifies that the economic growth of Balikpapan City, serving as a growth pole, plays a dominant role in driving the economic dynamics of North Penajam Paser and Kutai Kartanegara Regencies, in line with its position as a National Activity Center (PKN) with grater economic scale and sectoral capabilities.

Based on the analysis results, it can be observed that the relationship between Balikpapan City and North Penajam Paser Regency is unidirectional, where the economic growth of Balikpapan City can drive the economic dynamics of North Penajam Paser. This due to the fact that the economic activities of Balikpapan City play a dominant role over North Penajam Paser Regency. This can be due to variations in economic development levels, infrastructure, and the concentration of economic activity in Balikpapan City. Balikpapan's economic activities are dominated by advanced sectors such as manufacturing, wholesale and retail trade, construction, transportation, warehousing, and business services, serving as the center of regional production and distribution activities. These sectors create high demand for intermediate goods, food supplies, labor, and supporting services, much of which is supplied from North Penajam Paser Regency as a hinterland.

On the other hand, the economic growth of North Penajam Paser Regency is more focused on agriculture, forestry, fisheries, construction, and government services, positioning the region primarily as an economic buffer for Balikpapan City. When Balikpapan's trade, industry, and logistics sectors expand, the agricultural, fisheries, local transportation, household consumption, and construction sectors in North Penajam Paser also increase through input demand channels, labor mobility, food trade, and daily commuting of residents to Balikpapan. However, because the leading sectors in North Penajam Paser do not have sufficient scale to drive the flow of goods, capital, and services toward Balikpapan, the economic growth of North Penajam Paser does not contribute to the economic growth of Balikpapan City.

The development activities of the IKN, which are concentrated within North Penajam Paser Regency, are mostly recorded as local output in North Penajam Paser, while Balikpapan City's contribution is primarily in supporting functions such as logistics and accommodation. These impacts are partial and do not significantly affect Balikpapan's core sectors at a scale sufficient to create stable spatial dependency. This condition explains why, statistically, no causal relationship is found from the economic growth of North Penajam Paser Regency to the economic growth of Balikpapan City, even though North Penajam Paser's economic growth surged dramatically in 2022 to 2024.

The economic growth of North Penajam Paser Regency through the development of the IKN still impacts several sectors in Balikpapan City as the main supporting area. The transportation and warehousing sectors are affected by the increased flow of construction materials entering through Semayang Port and Sepinggan Airport. The accommodation and food & beverage sectors also experience higher demand due to the mobility of workers, contractors, experts, and civil servants who are active in the IKN but reside or transit in Balikpapan City. Additionally, the wholesale and retail trade sectors benefit from the increased demand for building materials, project equipment, and daily consumption goods supplied from Balikpapan. Although these impacts are not large enough to establish a causal relationship econometrically, these sectors still receive direct benefits from the high economic growth of North Penajam Paser during the IKN development period.

Based on the analysis results, it can be observed that the relationship between Balikpapan City and Kutai Kartanegara Regency exhibits a bidirectional or reciprocal pattern, although the influence is still dominated by Balikpapan. This is also consistent with the movement pattern of the economic growth graphs of both regions, which appear to move together. Kutai Kartanegara Regency serves as a hub for mining, agriculture, and industries reliant on natural resources in East Kalimantan. Balikpapan City serves as a center for trade, logistics, processing, and business services, acting as the main service city that facilitates capital goods, support services, transportation, and distribution for mining, plantation, and industrial operations in Kutai Kartanegara Regency. In contrast, Kutai Kartanegara Regency acts as the primary source of raw materials, energy, and agricultural and plantation products, which are vital components for the trade and manufacturing industries in Balikpapan City. The link between Balikpapan City and Kutai Kartanegara Regency creates a regional economic connection that

encourages economic growth for both, where shifts in economic activities in Balikpapan frequently lead to changes in the dynamics of sectors in Kutai Kartanegara.

The causal link between Balikpapan City and Kutai Kartanegara Regency mainly takes place through trade, business services, logistics, and construction industries. The manufacturing industries in Balikpapan's service sectors need raw materials sourced from Kutai Kartanegara, whereas the mining and plantation sectors in Kutai Kartanegara rely on logistics, transportation, and financial services based in Balikpapan. When the trade and service sectors in Balikpapan grow, the demand for outputs from Kutai Kartanegara, such as coal, palm oil, fish, and agricultural products, also increases, thereby stimulating the growth of sectors in Kutai Kartanegara. Moreover, the majority of significant corporations functioning in Kutai Kartanegara, be it in mining or agriculture, either have their main offices or employ business support services in Balikpapan. Consequently, the growth of business services, construction, and logistics industries in Balikpapan can create favorable spillover effects for mining, manufacturing, and trade activities in Kutai Kartanegara Regency.

The results of this study are in line with the findings of literature [6] and literature [7], which found that the economic growth relationship between regions adjacent to a growth pole is reciprocal. Such regions not only influence economic growth but also receive growth dynamics from other areas. This aligns with George Bort's view, which states that the dynamics of economic activity in a region are not solely determined by the region's own potential but are also influenced by the base sectors of surrounding areas, particularly through labor and capital mobility.

Spillover Effect

The Spillover Effect not only indicates the direction and magnitude of the influence but also the nature of the spillover, which can be a spread effect producing a positive impact or a backwash effect producing a negative impact. Thus, the discussion of the spillover effect provides a comprehensive understanding of how the regional economic growth spillovers occur and the extent to which Balikpapan City can act as the main driver in the economic structure of East Kalimantan. The interregional spillover effect of economic growth in this study can be visualized as follows.

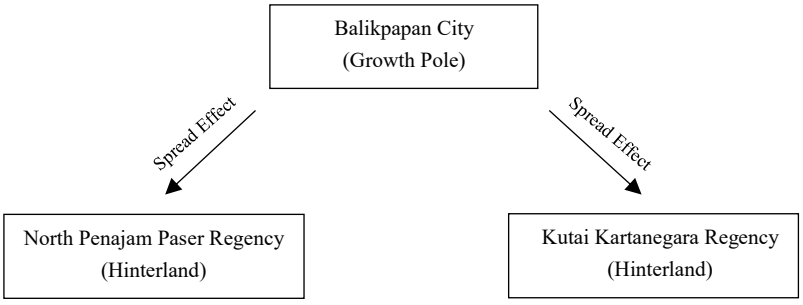


Fig. 3. Interregional Spillover Effect

The spillover effect observed is positive (spread effect), with no indication of a backwash effect. This means that Balikpapan's economic growth does not excessively absorb resources from surrounding areas but instead provides a positive contribution to the economies of North Penajam Paser Regency and Kutai Kartanegara Regency. These findings clearly illustrate that Balikpapan City's economic growth can serve as a primary driver, stimulating the growth of surrounding regions.

Based on the analysis results, it can be observed that the spillover effect from the economic growth of Balikpapan City to North Penajam Paser Regency is a spread effect, with no indication of a backwash effect. This means that Balikpapan's economic growth does not excessively absorb resources from surrounding areas but instead provides a positive contribution to the economy of North Penajam Paser Regency. The economic growth of Balikpapan City generates a strong spillover effect on North Penajam Paser Regency because Balikpapan functions as a growth pole within the regional economic structure of East Kalimantan. The dominance of modern sectors such as wholesale and retail trade, manufacturing, business services, logistics, and construction makes Balikpapan a center for capital accumulation, technology, and production activities. With the growth of these sectors, the need for raw materials, workforce, consumer products, and auxiliary services rises, directly affecting the adjacent buffer zone, such as North Penajam Paser Regency.

The primary pathways of Balikpapan's spillover impact on North Penajam Paser are clear via the links in trade, construction, transportation, and service industries. The expansion of trade and manufacturing in Balikpapan boosts the need for agricultural, fishery, and local products from North Penajam Paser, consequently enhancing producers' income in the regency. Similarly, the elevated construction activity in Balikpapan generates a need for construction materials and labor, which is partly met by North Penajam Paser. Commuting between Balikpapan City and North Penajam Paser is also an important mechanism for the spillover effect, as the expansion of Balikpapan's service and industrial sectors absorbs labor from North Penajam Paser, which in turn increases household income and consumption in the region. Consequently, the expansion of Balikpapan's key sectors leads to increased growth for agriculture, fisheries, construction, local transport, and trade sectors in North Penajam Paser Regency.

In addition to the production sectors, the spillover effect from Balikpapan City to North Penajam Paser Regency is also reinforced by differences in infrastructure capacity, which position Balikpapan as a regional growth pole. Balikpapan has strategic infrastructure such as Sultan Aji Muhammad Sulaiman Sepinggan International Airport, Semayang Port, the Kariangau logistics port network, as well as large industrial estates and distribution warehouses, which are not available in North Penajam Paser. This infrastructure makes Balikpapan the main gateway for the flow of goods, services, and people in southern East Kalimantan.

Moreover, Balikpapan has major referral hospitals, comprehensive banking services, shopping centers, corporate offices, and educational and modern service facilities that are not yet available in North Penajam Paser. This infrastructure disparity causes the residents and economic actors of North Penajam Paser to heavily depend on Balikpapan for access to logistics, transportation/distribution, trade services, healthcare, and large scale economic activities. As a result, any increase in economic activity in Balikpapan

flows to North Penajam Paser through labor mobility, regional consumption, and rising demand for local commodities. Therefore, Balikpapan's infrastructure advantages establish it as a growth pole that naturally generates spillover growth in the form of a spread effect.

Based on the analysis results, it can be observed that the spillover effect from the economic growth of Balikpapan City to Kutai Kartanegara Regency is a spread effect, with no indication of a backwash effect. This means that Balikpapan's economic growth does not excessively absorb resources from surrounding areas but instead provides a positive contribution to the economy of Kutai Kartanegara Regency. Balikpapan City has leading sectors such as wholesale and retail trade, logistics, manufacturing, business services, and construction, which function as a center of regional economic activity. Meanwhile, Kutai Kartanegara Regency, as an area with a base in mining, plantations, and agriculture, supplies raw materials, primary commodities, and energy resources for industrial and trade activities in Balikpapan. As the service, industrial, and trade sectors in Balikpapan expand, the need for products from Kutai Kartanegara rises, encouraging growth in both the primary and derivative sectors within the area.

The spillover effect from Balikpapan City to Kutai Kartanegara Regency is strengthened by Balikpapan's strategic infrastructure benefits, including Sultan Aji Muhammad Sulaiman International Airport, Semayang Port, the Kariangau logistics port network, industrial zones, and a banking and business service network that Kutai Kartanegara lacks to the same extent. This infrastructure positions Balikpapan as the main entry point for goods, capital, skilled labor, trade services, and logistics, which then flow to Kutai Kartanegara to support mining, plantation, and agricultural activities.

Although Kutai Kartanegara is a region contributing significantly to economic growth, particularly from the mining sector, its influence on Balikpapan is not entirely significant in the short term. This is due to the fact that the mining and plantation industries in Kutai Kartanegara possess value chains that are primarily external, linking to national and global markets instead of concentrating on Balikpapan.

The results of this study are in line with the findings of literature [6] and literature [7], which found that the positive spillover are determined not only by leading sectors and government trade policies but also by spatial conditions and infrastructure.This aligns with Hirschman's view, which explains that the implementation of growth poles must be followed by a trickle-down effect and a spread effect through synchronized activities between the growth center and the resource base in rural areas.

5 Conclusions

The causal relationship between Balikpapan City and North Penajam Paser Regency is unidirectional, where the economic growth of Balikpapan City can stimulate the economic dynamics of North Penajam Paser Regency, while conversely, the economic growth of North Penajam Paser has not yet been able to drive the economic growth of Balikpapan City. The relationship between Balikpapan City and Kutai Kartanegara Regency exhibits a bidirectional or reciprocal pattern, although the influence is still dominated by Balikpapan.

Balikpapan City provides a positive spillover effects (spread effects) toward both North Penajam Paser and Kutai Kartanegara Regencies. However, the economic growth of North Penajam Paser and Kutai Kartanegara has not been adequate to considerably influence the economic growth of Balikpapan City.

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