

## Competitiveness of the Secondary Sector in North Kalimantan: Quantifying the Socio-economic Impact

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### Abstract

The weak support for the secondary sector in providing value-added to the primary sector can potentially become a problem in increasing GRDP in North Kalimantan. This research aimed to measure the competitiveness of the secondary sector in each region in North Kalimantan and find out how socio-economic factors influence it. Quantifying competitiveness by combining the three methods, LQ, GRM, and Shift-Share analysis, was the new method. Meanwhile, Panel data regression was carried out to determine the influence of socio-economic variables on competitiveness, which consisted of Government Expenditure, Direct Investment, and Human Development Index. Based on the results of the competitiveness analysis, it was known that the two regions, namely the municipal area, Tarakan, and the provincial capital district, Bulungan, consistently showed competitive secondary sectors. Meanwhile, Tana Tidung, Nunukan, and Malinau Regencies had not developed in their secondary sectors. The regression analysis results showed that the socio-economic factors in each region had not been able to support the competitiveness. Increasing support for the secondary sector still needs to be enhanced with government, private sector, and socio-economic society support.

**Keywords:** *Secondary Sector, Competitiveness, Social, Economy.*

**JEL Classification:** O11, O25, O47

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### INTRODUCTION

The secondary economic sector, or the industrial sector, involves transforming raw materials into finished products. This condition supports a region's economy when it supports the primary sector. Existing conditions in developing regions generally have potential and competitiveness in the primary sector, especially in the province of North Kalimantan. Using RCA, the export potential for Indonesia's economic competitiveness is still weak and strong in some countries (Ikasari, 2024).

North Kalimantan has the advantage of potential and competitiveness in the primary sector (Hatta, 2023; Hatta & Darmawanto, 2020). This area has potential

in the mining sector (coal, oil and gas, and other minerals), as shown by the large proportion of the mining and quarrying sector compared to other regions. Despite its superiority in the primary sector, the study showed that this province is still weak in the potential of the secondary sector. Economic capacity has greater opportunities if it is supported by secondary sector capacity.

This research will implement the measurement of secondary sector competitiveness by formulating a combination of competitiveness measurements from previous studies. Previous research measured the economic basis using Location Question (LQ) analysis (Nurfani, Dewanti, & Sitaresmi, 2020; Veransiska & Imaningsih, 2022), Growth Ratio Model (GRM) (Kekry, 2021; Pratomo, 2014), and Shift-Share (Basuki & Nugroho Mujiraharjo, 2017; Negara & Putri, 2020). These three methods can be combined if the analysis results are identical. Thus, combining these methods is carried out by knowing the average of all the methods. Thus, the average figure illustrates the total economic competitiveness of the economic sector, especially the secondary sector, which is the object of this research and what is new to develop measurements. The previous research mentioned showed its own strength by each method. It will be strengthened further by combining each strength method. However, the consequence is in Shift-share, which is the result in nominal, has to be transformed into an identical number with LQ and GRM (ratio).

In efforts to develop the economy, particularly in the secondary sector, it is necessary to understand the socio-economic impacts. This is a characteristic of a region that determines whether it is industrial or not. An analysis is needed to examine the factors that influence the competitiveness of the secondary sector to improve it. Previous research by Anggraini et al. (2021) researched the role of government, in this case, infrastructure, in the industrial sector. Besides the government support, the next study also analyzes the effect of human capital, regional minimum wages, and labor force on Central Java's manufacturing sector's economic growth (Winarto, Zumaeroh, & Retnowati, 2022). Meanwhile, Mulyadi et al. (2018) and Parahita et al. (2018) have studied the influence of socio-economic influences, namely wages, investment, and government support for the industrial sector. The social conditions of society are described based on the level of welfare as measured by the human development index (HDI) in an area.

Thus, strong government support, private sector investment, and good socio-economic conditions in the community also encourage the competitiveness of the secondary sector, enabling it to support the superiority of the economic sector in North Kalimantan. Based on the description above, it is necessary to study the supporting capacity for developing the secondary sector to increase income further (Reganold, Papendick, & Parr, 2008). This carrying capacity must be studied from various aspects of sustainability (Hapsoro & Bangun, 2020; Ilham, 2021), including socio-economic factors, namely support from the government, private sector, and society (Fauzi & Oxtavianus, 2014). Therefore, this research needs to examine integrating the roles of government, the private sector, and society in the competitiveness of the secondary sector. The results of the analysis are recommendations for the government to pay more attention to supporting optimization in the competitiveness of the industrial sector.

## **METHOD**

### **Research Design**

This research uses quantitative methods. Quantitative research methods use numerical data and emphasize the research process of measuring objective results using statistical analysis. The focus of quantitative methods is to collect data sets and make generalizations to explain specific phenomena experienced by the population. Quantitative research is finding knowledge that uses numbers to analyze information about what you want to know.

The object of this research is the GRDP of the Processing Industry business field; Electricity and Gas; Water and Recycling; and Construction in five City Districts in North Kalimantan Province (the City of Tarakan, Regency of Bulungan, Tana Tidung, Nunukan, and Malinau). The research was carried out in Tarakan City, North Kalimantan Province. The time for conducting the study is January 2024 to August 2024.

The data used in this research is secondary data. Secondary data is previously collected and reported by people or agencies outside the researcher themselves, even though what is collected is original data. Secondary data can be obtained from agencies and libraries. The secondary data required in this research are shown in Table 1.

The secondary sector, consisting of the four components in Table 1, is then summed up to determine the value of each of the five regions, which will then measure their competitiveness. The value of each sub-variable is a component of the GRDP in rupiah. Meanwhile, the socio-economic aspect uses measures of government expenditure, direct investment, and the human development index, which will be used as predictors of the competitiveness of the secondary sector.

**Table 1.** Research Variables

<b>Variables</b>	<b>Unit</b>	<b>Description</b>	<b>Symbol</b>	<b>Sector (i)</b>	<b>Time (t)</b>	<b>Sources</b>
<b>Secondary Sectors</b>						
Industry	IDR	Value of Industrial Production	$Y_1$	$Y_1^1, \dots, Y_1^5$	$Y_1^{2017}, \dots, Y_1^{2023}$	BPS Kaltara, Malinau, bulungan, Tana Tidung, Nunukan, Tarakan, 2016-2023
Electricity and Gas	IDR	Value of Electricity and gas	$Y_2$	$Y_2^1, \dots, Y_2^5$	$Y_2^{2017}, \dots, Y_2^{2023}$	
Water and Recycling	IDR	Value of Water and Recycling	.	.	.	
Construction	IDR	Value of Construction	$Y_4$	$Y_4^1, \dots, Y_4^5$	$Y_4^{2017}, \dots, Y_4^{2023}$	
<b>Socio-economic Aspect</b>						
Government Expenditure	IDR	APBD of Regency and City	$GE$	$GE^1, \dots, GE^5$	$GE^{2017}, \dots, GE^{2023}$	
Direct Investment	IDR	Value of Domestic and Foreign Investment	$DI$	$DI^1, \dots, DI^5$	$DI^{2017}, \dots, DI^{2023}$	
Human Development Index	Indices	Human Development Indices	$HDI$	$HDI^1, \dots, HDI^5$	$HDI^{2017}, \dots, HDI^{2023}$	

The first calculation, LQ, describes a region's comparative advantage compared to other areas (Hatta & Darmawanto, 2020; Nurfani et al., 2020; Veransiska & Imaningsih, 2022). Calculations are carried out using Static Location Quotient (SLQ) and Dynamic Location Quotient (DLQ). The formula is:

$$LQ = \frac{\frac{Y_{ijt}/Y_{jt}}{Y_{int}/Y_{nt}} + \frac{1+(gY_{ijt}/gY_{jt})}{1+(gY_{int}/gY_{nt})}}{2} \quad (1)$$

Description:

- $Y_{ijt}$  = Value of the industrial sector in an area
- $Y_{jt}$  = Total Value of all sectors/GRDP in an area
- $Y_{int}$  = Total Value of the industrial sector in all areas
- $Y_{nt}$  = Total Value of all sectors/GRDP in all areas.
- $g$  = growth

The LQ calculation averages the sum of the SLQ, which calculates the proportion of the industrial sector in a region to the total industrial sector of the entire region and the DLQ, which calculates the ratio of industrial sector growth to the total growth of the industrial sector in the entire analysis area. Data from the variable descriptions above, namely  $Y_{ijt}$ ,  $Y_{jt}$ ,  $Y_{int}$ ,  $Y_{nt}$ , and  $g$  are then still used in the calculation of the next analysis tool.

The second method is GRM, which complies (Herawaty & Bangun, 2018; Kekry, 2021; Pratomo, 2014; Riantika & Utama, 2017; Wibawa & Zulfikar, 2017), used to analyze potential economic sectors. To formulate a way to analyze GRM by adding "1+" to reduce value disparities, as done in the model (2), it is as follows:

$$GRM = \bar{\Sigma} \frac{\left(\frac{1+gY_{ijt}}{1+gY_{nt}}\right)}{\left(\frac{1+gY_{int}}{1+gY_{nt}}\right)} \quad (2)$$

The GRM calculation compares the ratio of industrial sector growth in a region to the growth of industrial sectors across the entire analysis area. This method measures how competitive sector growth is in a region compared to other regions.

The third method, shift-share analysis, is used to see a picture of regional subsector growth that contributes to or is pressured by the broader economy above it. This analysis adds to the results of previous research so that the potential and competitiveness of the regional agricultural sector become more accurate. Positive shift-share results indicate that the regional agricultural subsector has more potential and is more competitive, and vice versa (Andi, 2020; Negara & Putri, 2020). The influence of national economic growth ( $N_{ijt}$ ), Industrial Mix ( $M_{ijt}$ ), and the competitive advantage ( $C_{ij}$ ). Real impact on regional economic growth or shift-share Value ( $D_{ij}$ ) is:

$$D_{ijt} = N_{ijt} + M_{ijt} + C_{ijt} \quad (3)$$

To synergize with LQ and GRM, D is changed to an equivalent number, namely SS. This is done with,

$$SS = \bar{\sum} \frac{1 + (D_{ijt}/D_{jt})}{1 + (D_{int}/D_{nt})} \quad (4)$$

Description:

$D_{ijt}$  = Value of Shift-share sector  $i$ , area  $j$ , year  $t$

$D_{jt}$  = Total Value of shift-share area  $j$ , year  $t$

$D_{int}$  = Total Value shift-share  $i$ , year  $t$

$D_{nt}$  = Total Value of shift-share, in North Borneo, year  $t$

The SS calculation measures the competitiveness of a region's shift share compared to the total competitiveness of the region. This method is a development of the Shift Share method, which is used to determine the strength of numbers =, >, or < 1. This facilitates the measurement and interpretation of industry shifts.

To find out the numbers that contribute to the three methods, namely LQ-GRM-SS (CNV), to become the dependent variable (Competitiveness), this is carried out by:

$$CNV_{it} = \frac{LQ + GRM + SS}{3} \quad (5)$$

The results of the CNV analysis are based on a gain rate of >1, meaning that the specialization of a particular sector at the regional level is excellent and faster than the same sector at the provincial level. On the other hand, <1 indicates that the level of specialization of a particular sector at the regional level is smaller and slower than that of the same sector at the provincial level.

### Panel Data Regression Analysis

Panel data regression combines time series regression and cross-section (Gujarati, 2021). The panel data regression equation to analyze the influence of government spending, direct investment, and HDI on the potential and competitiveness of the secondary sector can be written as follows:

$$\sqrt[3]{LQ + GRM + SS}_{it} = \beta_0 + \beta_1 GE_{it} + \beta_2 DI_{it} + \beta_3 HDI_{it} + \varepsilon \quad (6)$$

Description:

$\beta_0$  = Constant

$\beta_1, \beta_2, \beta_3$  = Coefficient

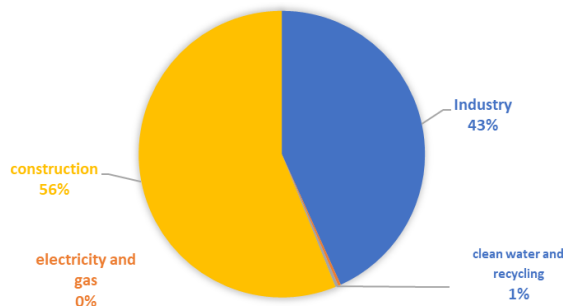
The regression model estimation method using panel data can be done using three approaches, including the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) (Iqbal, 2015; Ratnasari, Audha, & Dani, 2023). To select the most appropriate model, you can use the Chow, Hausman, and Lagrange Multiplier (LM) Test (Caraka & Yasin, 2017; Iqbal, 2015). The Chow test is used to select the best model between CEM and FEM; if the Chow test results show a prob value of cross-section chi-square < 0.05, then the FEM model is better than CEM, and vice versa. The Hausman test is used to choose a more appropriate

model between FEM and REM; if the Hausman test results show prob. cross-section chi-square  $< 0.05$ , then the FEM model is more appropriate than REM, and vice versa. The LM test determines the best model between REM and CEM. If the LM test results show a value of both  $< 0.05$ , then REM is more appropriate than CEM, and vice versa.

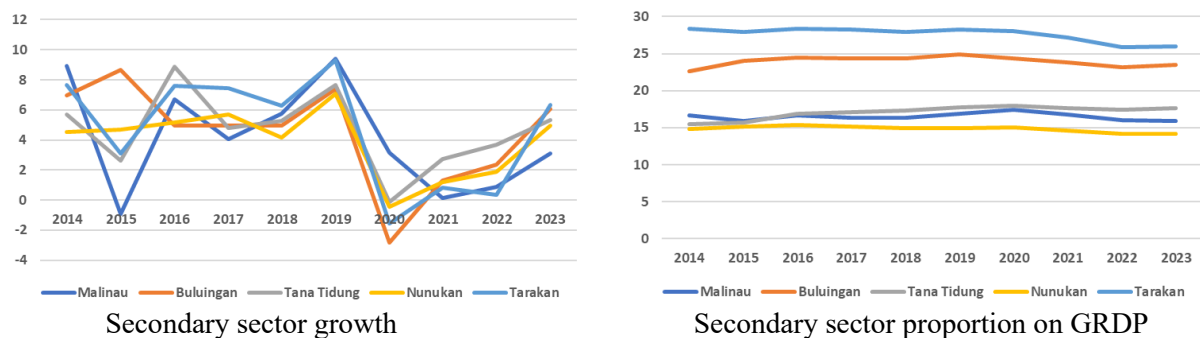
## RESULTS AND DISCUSSION

### Variable Description

Data on the production value of the secondary sector, consisting of the Processing Industry, Electricity and Gas, Water and Recycling, and Construction, can be described based on the development of growth and proportions each year.

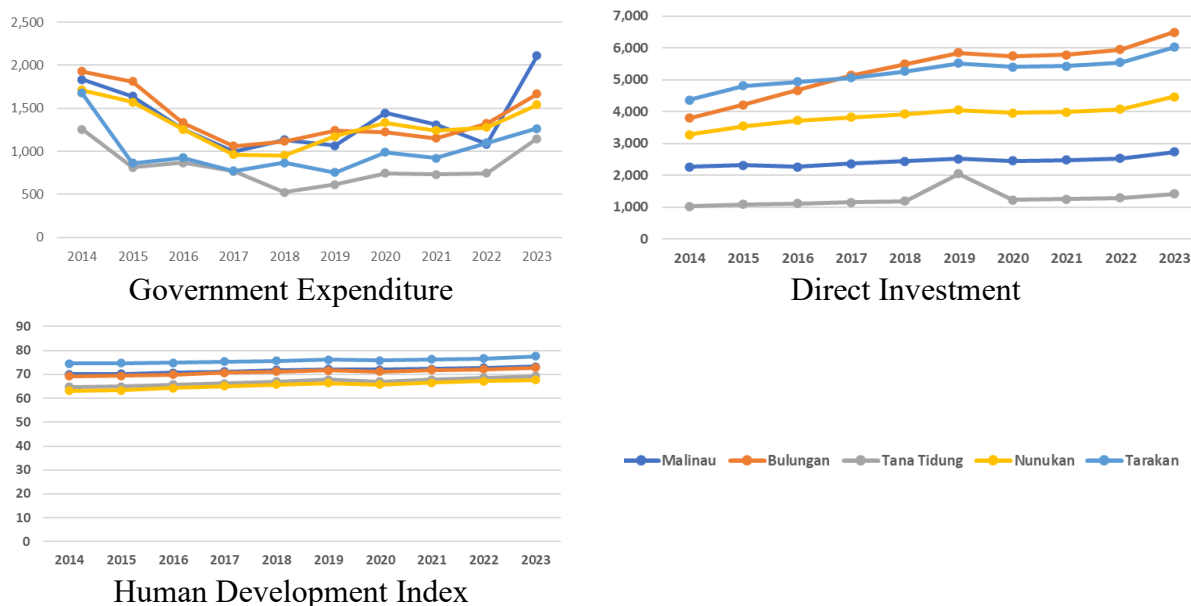


**Figure 1.** Overview of the Secondary Sector in North Kalimantan



**Figure 2.** Proportion of Business Production Value in the Secondary Sector  
Source: Badan Pusat Statistik (2023)

Based on the graph in Figure 2, industrial sector growth at the beginning of the period was at 2% to 8% per year. In 2020, this sector declined to focus on mines, but it increased again after the pandemic. On the other hand, the proportion of the secondary sector varied significantly across different regions. The Tarakan and Bulungan regions showed the largest proportion, namely around 23% and 27% of GRDP; the rest of the other areas were around 15% to 17%. Overall, the contribution proportion of the secondary sector in Figure 1 showed that the construction and processing industries were the major contributors.

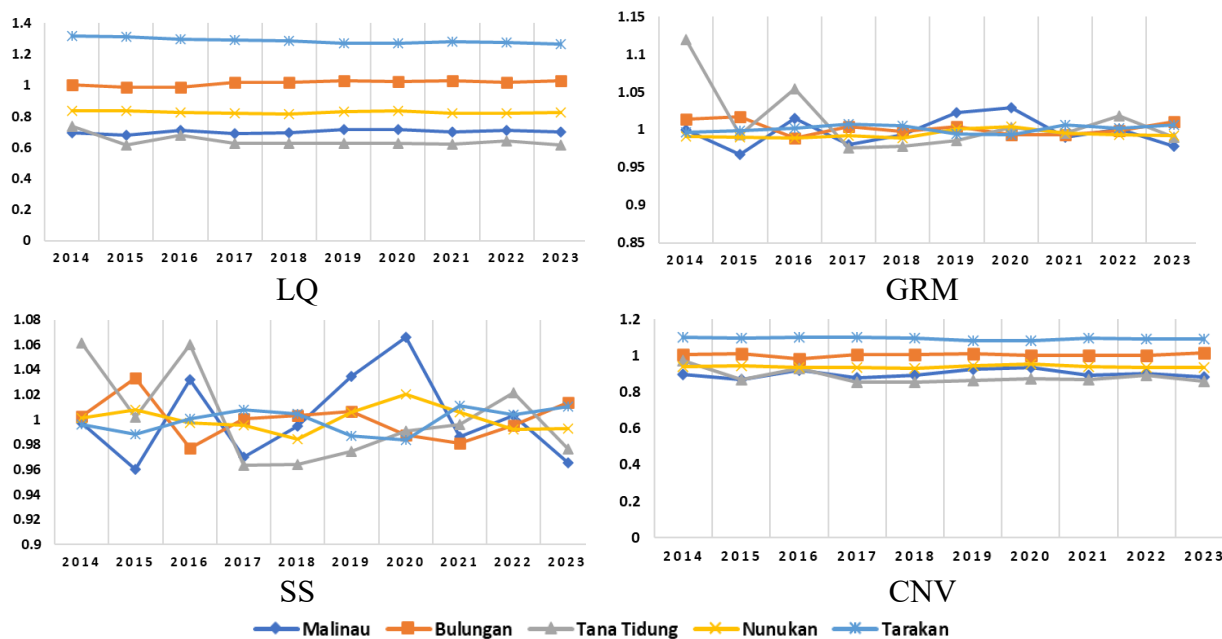


**Figure 3.** Government Expenditure, Direct Investment, and HDI  
Note: Regional government expenditure and investment in billions of rupiah  
Source: Badan Pusat Statistik (2023)

Regional government expenditure showed the same pattern in each region from the beginning to the end. All regions showed decreasing spending in the middle of the period and again showed an increase until the end. This was different from direct investment, which showed an increase every year. The highest investment was in the Tarakan City and Bulungan Regency areas. The lowest investment was in the Tana Tidung Regency area. In line with the socio-economic indicator, namely HDI, the regions with the best level of welfare were the regions most touched by development activities.

### Results of the analysis of the Potency and Competitiveness of the Secondary Sector

The analysis results showed numbers that range below one and above one. Results that were right at number one indicate that the secondary sector in the region had the same potential and competitiveness as at the provincial level. Results were calculated by looking at the proportion of GRDP and growth. The LQ, GRM, and SS graphs depicted the development of competitiveness. Meanwhile, these three results were integrated into the CNV form, as shown in Figure 4.



**Figure 4.** Competitiveness of the Secondary Sector in North Kalimantan

The graph above shows a combination of data from three instrument variants and the latest CNV, further complementing the research data mentioned previously. Other variations are also shown through multiple regions and time series, resulting in combined panel data from a cross-section of five regencies/cities and a time series (annual), allowing for further econometric analysis.

The results of the LQ analysis showed that areas that were touched by many development activities had better competitiveness in the secondary sector than elsewhere. That was consistent throughout the years of observation. This was slightly different from the GRM results, where the average results tend to be close to one and like the SS results. The picture in each region shows inconsistent competitive results in each year. Meanwhile, integrating the three models shown in the CNV figures again showed consistency each year, where development activities influence these regional results.

The results show that each region has its own characteristics regarding different industrial activities. Tana Tidung Regency and Tarakan City are regional centres that carry out many activities in the secondary sector. Meanwhile, other regions such as Nunukan, Malinau, and Tana Tidung Regencies still rely on the primary sector. In this case, the secondary sector still needs to be stimulated to support increasing income.

Another illustration that shows the still weak proportion of the processing industry sector is that the construction sector is still dominant in the secondary sector. However, efforts to increase the value-added of products are demonstrated by the large proportion in the secondary sector. A practice that is still common is the widespread sale of raw materials outside the region, either from districts to industrial areas or even from North Kalimantan province to outside the region.

### The Influence of Socio-Economic Aspects on the Potential and Competitiveness of the Secondary Sector

The regression analysis that had been carried out using Stata 17 was combined into Table 2, which compares CEM, FEM, and REM.

**Table 2.** Results of Regression Analysis with Three Approaches

Methods	CNV	Coefficient	Std. Err.	t	P>t z	[95% conf. Interval]	
CEM	GE	-0.0000188	0.0000172	-1.09	0.281	-0.0000535	0.0000159
	DI	0.0000331	0.00000446	7.41	0.000	0.0000241	0.0000421
	HDI	0.0059853	0.001876	3.19	0.003	0.0022091	0.0097615
	_cons	0.4473707	0.1277297	3.5	0.001	0.1902642	0.7044772
	F	44.48	prob > F = 0.0000				
	R <sup>2</sup>	0.7436					
FEM	GE	0.0000124	0.0000108	1.14	0.261	-0.00000953	0.0000342
	DI	0.0000104	0.0000096	1.09	0.284	-0.00000896	0.0000298
	HDI	-0.005958	0.0035478	-1.68	0.101	-0.0131177	0.0012017
	_cons	1.330658	0.2252461	5.91	0.000	0.8760924	1.785223
	F	F(3,42)=1.45	Prob > F = 0.2406				
	R <sup>2</sup>	0.002					
REM	GE	0.0000173	0.0000148	1.17	0.243	-0.0000118	0.0000464
	DI	0.0000247	0.00000708	3.49	0.000	0.0000108	0.0000386
	HDI	0.0016129	0.0029187	0.55	0.581	-0.0041077	0.0073334
	_cons	0.7418031	0.193145	3.84	0,000	0.3632458	1.12036
	F	-					
	R <sup>2</sup>	0.6764					

The best model selection using the Chow, Hausman, and LM tests was done by summarizing the results in Table 3.

**Table 3.** Test for the Best Model

Test	Decision
chow test	FEM is better than CEM
Prob > F = 0.0000	
Hausman test	FEM is better than REM
chi2(3) = 282.94	
Prob > chi2 = 0.0000	
LM test	REM is better than CEM
chibar2(01) = 18.89	
Prob > chibar2 = 0.0000	

From the results of model selection, it was decided that the most appropriate model to explain the influence was the FEM model. Nevertheless, the CEM and REM models could still be considered to provide explanatory support for the impact of government spending, direct investment, and HDI on the competitiveness of the secondary sector.

The results of the classical assumption test were used to determine whether the data were suitable for regression analysis using autocorrelation and heteroscedasticity tests. The test results are shown in Table 4.

**Table 4.** Classical Assumption Test

Correlate GE DI HDI			Result
(obs=50)			
	GE	DI	HDI
GE		1	
DI	0.1788		1
HDI	-0.0296	0.5449	1
<b>Heteroskedasticity</b>			<b>Result</b>
Breusch–Pagan/Cook–Weisberg test for heteroskedasticity			
chi2(1)	0.76		prob > 0.05, pass the
Prob > chi2	0.3842		heteroscedasticity problem

The classical assumption test results showed that each variable's correlation figure was below 0.85. The number indicated that the data were free from multicollinearity problems. Thus, the heteroscedasticity test using the Breusch-Pagan test showed a number greater than 0.05, meaning no heteroscedasticity problem exists.

The panel data regression analysis shows that socio-economic influences in government spending, direct investment, and HDI positively affect potential and competitiveness of the secondary sector. That influence indicates that government spending, direct investment, and HDI in a region will encourage an increase in the competitiveness of the secondary sector. The most significant variable is direct investment based on the CEM and REM models. This result is different from HDI, which significantly affects the industry in the REM model. The best model, namely FEM, shows that the three variables have no significant effect.

Government spending, mainly for economic functions, must be carried out to strengthen economic capacity through downstream products. This is in line with Ikasari's research (2024), which states the need for government support to encourage the manufacturing industry for export purposes. It is necessary to pay attention so that more and more businesspeople are involved in the industrial world (Mulyadi et al., 2018). Even though the analysis results have not shown significant results, which aligns with research on the influence of infrastructure on industrial growth (Anggraini et al., 2021), a Green Industrial Zone has been built in the North Kalimantan region for downstream regional products. This project will play a significant role in encouraging the growth of the secondary sector/industry.

Apart from the role of the government, what is no less important is the role of business actors who make investments. This study's results align with the findings of Parahita et al. (2018), which state that investors play a significant role in the growth of the business world. Investment data shows a positive trend from year to year, although certain regions still dominate it. Investment, of course, impacts the improvement and competitiveness of the secondary sector. This condition aligns with investment theory, which increases economic capacity and regional income. This condition demonstrates the importance of *G to B* in increasing industrial competitiveness, where the government continues to strive to create an investment climate in each region.

What is no less important is the social factor of society, where the better the quality of the population of an area, the more it will drive the economic improvement of the people in that area (Winarto et al., 2022). In this case, the

government must also pay attention to aspects of HDI, such as health, education, and people's per capita income. The better the quality of life of the people in an area, the more it supports the community's entrepreneurial activities. Furthermore, people's attraction to the business world must increase further, especially in the industrial sector.

The results of the best model, namely the FEM model, show that government spending, direct investment, and HDI still have no direct impact on efforts to increase and competitiveness of the industrial sector. That result indicates that government spending must be directed more towards encouraging businesses such as MSMEs. Likewise, direct investment shows that it is not precisely directed toward the world of the processing industry but more toward the primary sector in the form of petroleum, coal, and gas, as well as the agricultural sector in the form of palm oil and seaweed plantations, which are often found in this area.

## CONCLUSION

Based on the analysis results, the regions with potential and competitiveness in the secondary sector are Tarakan City and Bulungan Regency. At the same time, Nunukan, Malinau, and Tana Tidung Regencies still have not shown potential and competitiveness in this sector. The independent variables, namely government expenditure, direct investment, and HDI, generally have a positive effect on the potential and competitiveness of the secondary sector, but have not yet shown significance in the best model (FEM) from observations. Only direct investment is potentially significant in the other two observation models (CEM and REM).

To increase the competitiveness of secondary sectors, this research indicates that more government spending needs to be consistently directed towards improving the secondary sector, in this case, downstream products. More attention is needed to improve its support to MSMEs or small businesses, attract investors to build industry, and increase the quality of human development to increase local community business interest.

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