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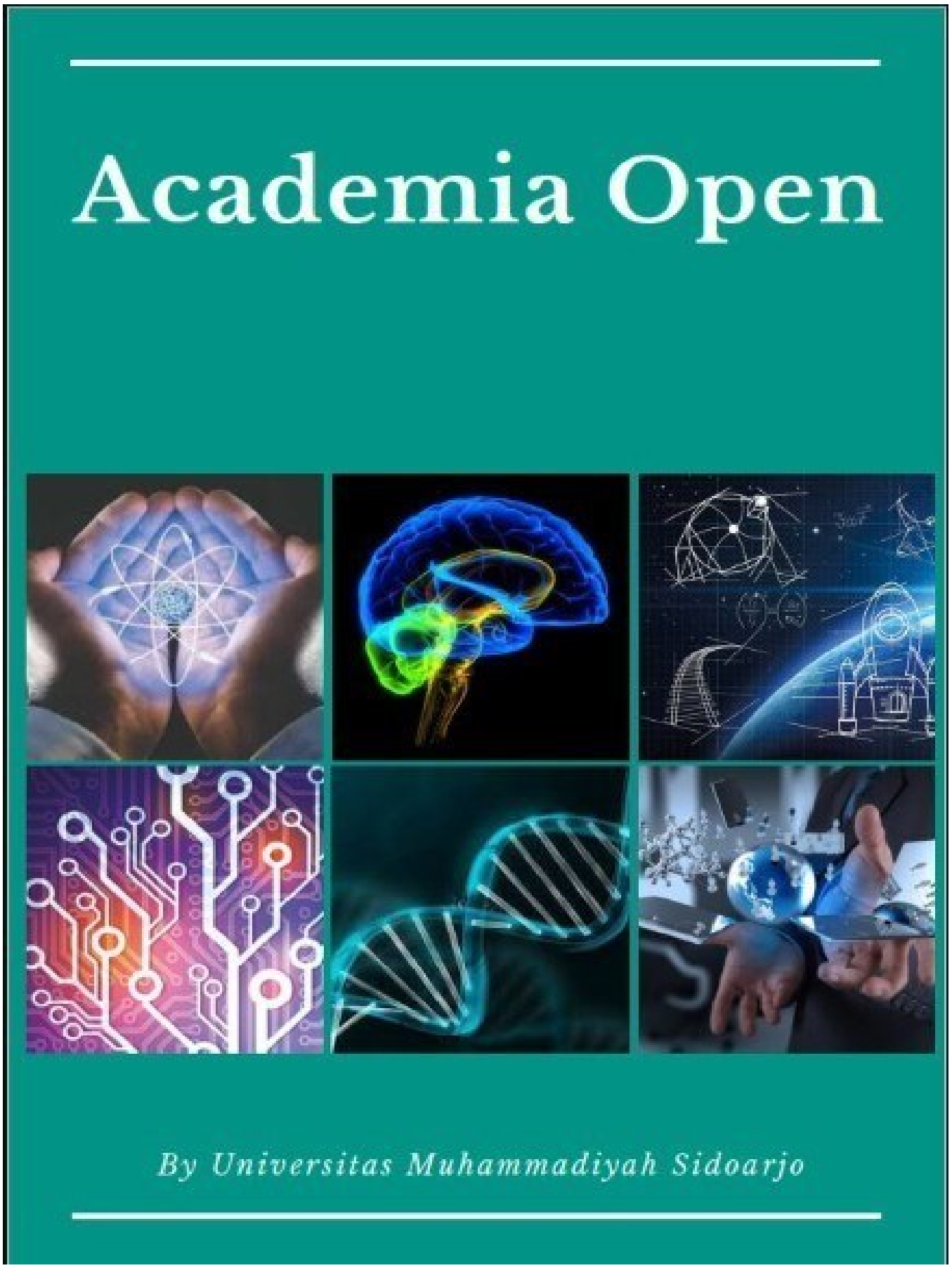

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Batam GRDP Centered on Manufacturing Construction and Hospitality

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Abstract

General Background: Regional economic growth is a key benchmark for assessing development success and sectoral performance. **Specific Background:** Batam City has distinct economic characteristics as a Special Economic Zone with a strategic location on international trade routes, making sectoral contributions to Gross Regional Domestic Product important for regional planning. **Knowledge Gap:** Previous studies generally examined strategic sectors separately, while integrated empirical evidence comparing manufacturing, construction, and accommodation and food service sectors in one model remained limited. **Aims:** This study aimed to analyze the individual and collective roles of manufacturing, construction, and accommodation and food service sectors in Batam City's economic growth using secondary time series data from 2016–2025 obtained from BPS and analyzed through OLS regression with EViews. **Results:** The regression model showed positive and significant coefficients for manufacturing at 0.7049, construction at 0.3419, and accommodation and food services at 0.0400. The F test was significant with a probability value of 0.000032, while the adjusted R square value reached 0.9629, indicating that the three sectors explained 96.29% of variation in economic growth. **Novelty:** This study integrates three strategic sectors into one empirical model using post recovery period data. **Implications:** Batam's development strategy should maintain industrial competitiveness while strengthening infrastructure quality and service sector expansion to support a more balanced and resilient regional economy.

Highlights:

- Secondary industry recorded the highest coefficient at 0.7049.
- Infrastructure activity showed a significant positive coefficient at 0.3419.
- Service accommodation contributed positively with a smaller coefficient.

Keywords: Economic Growth, Industrial Sector, Construction, Regional GDP

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Introduction

Economic growth is often used as the main benchmark in assessing the success of development in a region. In this context, the city of Batam has economic characteristics that differ from other regions in Indonesia due to its status as a Special Economic Zone (SEZ) [1]. Batam's geographical position on international shipping routes provides significant opportunities to develop various economic sectors to drive the increase of Gross Regional Domestic Product (GRDP). However, the dynamics of Batam's economy in recent years have shown fluctuations in inter-sector contributions, particularly in the secondary and tertiary sectors, in line with changes in global investment conditions[2]. Each region has different economic structure characteristics according to the potential of resources, level of investment, quality of infrastructure, and development policies implemented. These differences result in variations of leading sectors that play a role in driving the region's economic growth (Fauziyah et al., 2025). One of the regions that has shown quite rapid economic development is the city of Batam. As the center of industry and trade in the Riau Archipelago Province, Batam has a strategic position because it is located on the international trade route and directly borders Singapore and Malaysia. This condition makes Batam one of the economic growth centers with the largest contribution to the economy of the Riau Archipelago Province.

These conditions demand a deeper understanding of how the industrial, construction, and accommodation and food service sectors interact with each other to drive economic growth. This understanding is important so that long-term economic stability, especially in strategic areas like Batam, can be maintained. Various previous studies have discussed the factors that influence regional economic growth [3] assert that the sector the manufacturing industry plays a dominant role as the main driver of the urban economy. Meanwhile, [4] shows that the construction sector has an essential role in enhancing economic development thru infrastructure development as well as increased investment activity in developing regions.

This research offers novelty by integratively analyzing the influence of the manufacturing, construction, and hospitality sectors on the Gross Regional Domestic Product of Batam City within a single empirical model. Unlike previous studies that generally examined each sector separately, this research compares the relative roles of these three strategic sectors in shaping Batam's economic performance. By using the latest data after the economic recovery period, the research results are intended to offer more comprehensive overview regarding the sectors that are the main drivers of economic growth in the city of Batam, as well as serve as a basis for regional development policy formulation.

This research essentially aims to analyze how each economic sector, both individually and collectively, affects the macroeconomic growth rate in Batam City. Thru a quantitative approach, this study aims to examine the level of dependence of Batam City's economy on these three sectors. The research results are expected to serve as a consideration for the Batam City Government in conjunction with BP Batam while formulating a more balanced, sustainable, and competitive economic development strategy.

Methods

To obtain a more in-depth analysis, this study combines descriptive mapping with statistical verification within a structured quantitative research framework. An empirical model was built to measure the extent regarding the influence of the manufacturing sector (X1), the construction sector (X2), and the accommodation and food services sector (X3) on the economic growth of Batam City (Y). This research applies secondary data comprising annualized longitudinal data covering the period 2016–2025. The research population includes all economic sectors that constitute the Gross Regional Domestic Product (GRDP) in Batam City. Information were collected using documentation techniques by utilizing official publications released through the Central Statistics Agency (BPS) of Batam City and relevant regional government documents. To capture the precise structural relationship among the macroeconomic variables being studied, the analytical model is determined thru the following linear equation:

$$Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + e \qquad (1)$$

Earlier than performing inferential hypothesis examination, the model is initially examined thru multiple classical diagnostic analyses to ensure its statistical validity. All these analyses are undertaken to confirm the regression model fulfills the Best Linear Unbiased Estimator (BLUE) assumptions, so that the estimation results obtained are valid, efficient, and unbiased.

Results and Discussion

A. Results

The result of this study present empirical findings regarding the influence of the industrial sector, construction, and accomodation and food and beverage service toward economic expansion in Batam CityWith the following outcomes obtained from Classical Assumption Test:

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1. Normality Test

The normality test is conducted to see whether the residuals in the regression model follow a normal distribution.

Table 1. Normality Test Results

Statistic	Value
Jarque-Bera	0,8562
Probability	0,6518

Table 1 reveals that the outcomes from normality test yield a p-value amounting to 0.6518. This value exceeds the significance level of 0.05, indicating the residuals within the regression model can be considered normally distributed.

2. Multicollinearity Test

The multicollinearity test is conducted to identify the presence of a strong linear correlation among independent variables in the regression model.

Table 2. Multicollinearity Test Result

Variable	Centered VIF
Industrial Sector (X1)	1,0123
Construction Sector (X2)	1,5554
Food and Beverage Accomodation (X3)	1,5588

Table 2 indicates that every independent variable included in the regression model records a Centered VIF value under the criterion equal to 10. Such evidence the regression model does not exhibit multicollinearity problems. So each variable can explain its effect properly without causing estimation bias.

3. Heteroscedasticity Test

The current research uses the Breusch-Pagan-Godfrey method to determine whether the residual variance is stable across observations or changes over time.

Table 3. Heteroskedasticity Test Result

Indicator	Value
Prob.Chi-Square	0,2411

Table 3 shows a Chi-Square probability value of 0.241, which is above the 0.05 significance level. This suggests that the model meets the homoscedasticity assumption, meaning the residual variance tends to remain consistent across observations. Therefore, no indication of heteroskedasticity was found that might affect the reliability of the regression estimat

4. Autocorrelation Test

To check if the observation errors from the current period are correlated with those from the previous period, this study employs an autocorrelation test.

Table 4. Autocorrelation Test Results

Indicator	Value
Prob. Chi-Square	0,3974

The data visualization in Table 4 shows a Chi-Square Prob. value of 0.397, where the estimate confidently exceeds the critical value of 0.05. Consequently, this diagnostic evaluation validates the model's structural integrity, proving it is completely uncompromised by serial correlation disturbances.

5. Multiple Linear Regression Analysis

The present model applied to test the influence regarding the manufacturing sector, the construction sector, as well as the accommodation and food service sector on the economic growth of Batam City.

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Table 5. Multiple Linear Regression Estimation Results

Variable	Coefficient	Std.Error	T-Statistic	Prob.
Constant (C)	-0,5740	0,5544	-1,0352	0,3404
Industrial Sector (X1)	0,7049	0,0957	7,3595	0,0003
Construction Sector (X2)	0,3419	0,0490	6,9641	0,0004
Accomodation, Food and Beverage Sector (X3)	0,0400	0,0092	4,3424	0,0049

Referring to Table 5, the regression function is able to formulated into the equation :

$$Y = -0.5740 + 0.7049X1 + 0.3419X2 + 0.0400X3.$$

The explanation regarding the elasticity coefficients of this economic interaction equation is as follows:

a. The constant (-0.574) indicates that if the manufacturing sector (X_1), the construction sector (X_2), and the accommodation and food service sector (X_3) are assumed to be constant, the economic growth of Batam City is estimated to be -0.574. The negative constant value indicates that without the growth contribution from these three sectors, economic growth tends to decline.
b. The coefficient of the manufacturing sector (0.704) shows each one-unit rise of the manufacturing sector will boost the economic growth of Batam City by 0.704 units.
c. The construction sector coefficient (0.341) indicates that each one-unit rise of the construction sector, provided the remaining variables are held unchanged, will increase the economic growth of Batam City by 0.341 units.
d. The coefficient of the accommodation and food service sector (0.040) indicates that each one-unit rise of that sector, provided the remaining variables are held unchanged, will increase the economic growth of Batam City by 0.040 units.

6. t-test

Partial testing is applied to measure the degree of significance possessed by every independent variable in influencing the dependent variable. Referring to the findings from Table 5, the t-test outcomes can be described as follows:

Industrial sector (X1) : Shows Prob. Value of 0,0003 < 0,05. This indicates, individually, the industrial sector exerts a significant impact toward the economic growth of Batam City

Construction sector (X2) : Has a prob. Value 0,0004 < 0,05. This indicates that, partially, the construction sector exerts a significant effect toward the enonomic development in Batam City.

The accommodation and food services sector yields a coefficient of 0.040. While modest, this positive value indicates that the sector still actively contributes to overall economic growth.

7. F-Test

The simultaneous test is conducted to examine if the entire independent variables included under the regression model collectively impact economic growth.

Table 6. F-test Result

Indicator	Value
F-statistic	78.8924
Prob (F-statistic)	0,000032

Table 6 reveals the Prob. F-statistic value equal 0.000032, which is much smaller below the significance level equal to 0.05. Such findings reveal simultaneously, the manufacturing sector, the construction sector, and the accommodation and food service sector significantly influence the economic growth of Batam City. Thus, these three independent variables together are able to explain the variation in economic growth.

8. Coefficient of Determination (R2)

An essential parameter to detect the extent of the percentage variation in economic growth rate that can be justified by the combination of explanatory variables in the model.

Table 7. R2 Result

Indicator	Value
Adjusted R-squared	0,9629

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Table 7 reveals that the Adjusted R-squared value is 0.9629. The results indicate that 96.29% of the variation in the economic growth of Batam City can be jointly explained by the manufacturing sector, the construction sector, and the accommodation and food service sector included under the regression model. Meanwhile, the residual 3.71% is determined through additional determinants external to research model that are not included as independent variables.

B. Discussion

Statistical results confirm that these three strategic sectors are the main foundation supporting the long-term economic growth of Batam City. The strength of the regression model is reflected in the coefficient of determination value, which reaches 96.2%. This percentage indicates that the variation in Batam's economic growth is largely explained by the performance of the industrial sector, the construction sector, and the accommodation and food service sector. From the perspective of regional economic theory, this finding reinforces the proposed argument that regional growth is largely driven by the development of leading sectors capable of generating extensive economic multiplier effects. Batam, as a special economic zone, demonstrates the ability to integrate the secondary and tertiary sectors into a mutually reinforcing growth structure.[6]. In addition, the fulfillment of all classical assumption tests successfully demonstrates that the relationships identified in this study are statistically reliable and represent the actual economic conditions rather than random estimation results during the observation period.[7].

The manufacturing sector emerged as the dominant variable in this study. A regression coefficient of 0.704 points to a high level of sensitivity, meaning any expansion in industrial output directly and significantly drives GDP growth. Theoretically, this empirical evidence strongly validates Kaldor's First Law, which posits that manufacturing acts the main "engine of growth" for the economy due to its high productivity and increasing returns to scale. This finding also aligns with Export Base Theory, where the industrial sector operates as the "basic sector" generating external revenue that subsequently pumps liquidity into the local economic system[8].

This finding is highly consistent with [9], who identified Batam City as one of Indonesia s strategic centers for the electronics and shipbuilding industries. Nevertheless this research provides a more recent perspective by demonstrating that the resilience of Batam's industrial sector remained relatively strong even after the pandemic period. This condition is closely related to government efforts in maintaining investment attractiveness and preserving industrial competitiveness within the region. Furthermore the findings also support the view of [10] who argue that the industrial sector contributes not only through direct increases in GRDP but also through the creation of multiplier effects across other economic sectors. Rising industrial activity tends to stimulate higher demand for logistics services energy consumption and labor absorption all of which eventually contribute to stronger purchasing power and broader regional economic expansion.

The construction sector (X2) displays an equally vital contribution, carrying a coefficient value of 0.3419. Within Batam's specific development context, this positive trend proves that massive infrastructure projects such as road widening, international airport expansions, and the opening of new industrial estates have a direct, statistically significant correlation with accelerated economic growth. Physically, infrastructure development acts as a catalyst that compresses logistics costs and optimizes supply chain distribution efficiency[11].

This result contrasts with previous studies in other developing regions, where construction capital expenditures often generate only short-term economic shocks or temporary employment. In Batam, due to its status as a FTZ and SEZ, construction acts as a long-term productive asset. This finding aligns with[12], onfirming that infrastructure spending directly shifts the regional production frontier outward. It also corroborates [13], demonstrating that public and private capital injections into Batam's construction sector are not merely consumption burdens but highly productive investments that statistically yield compounding economic added value.

Lastly, although the accommodation and food service sector (X3) yields the smallest coefficient (0.0400), its influence remains statistically significant. This highlights how the tourism ecosystem and domestic household consumption play a complementary yet crucial role in fortifying local economic resilience. As a labor-intensive tertiary sector, it serves as an immediate safety net for urban employment. The relatively small coefficient value compared to manufacturing simply underscores that Batam's economic framework remains heavily weighted toward physical goods production rather than a pure service economy.

Nevertheless, this verified significance signals that economic diversification strategies targeting the tourism and culinary industries are bearing fruit. The presence of hotels, restaurants, and shopping centers in Batam is no longer just an isolated luxury instead, it functions as an essential supporting ecosystem that accommodates the influx of expatriates, business professionals, and international tourists. This is in line with research that states the presence of shopping centers, hotels, and modern infrastructure as dominant factors in shaping the brand image of Batam City as an international tourist and business destination.

Simultaneously, the synergy among these three sectors creates a robust, self-sustaining economic ecosystem in Batam City. The F-test results, which are highly significant ($p = 0.000032$), prove that Batam's economic growth cannot rely on a single sector in isolation. There is a deep structural interdependence: the construction sector builds the physical framework for factories to operate, the industrial sector utilizes this framework to produce goods and employ thousands

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of workers; and these workers subsequently spend their income, becoming the primary consumers driving the accommodation and food and beverage sectors. This finding is in line with [14] research that states that infrastructure development and the interconnection of economic activities between sectors play a crucial part in driving economic development together with regional well-being.

While dominant influence of manufacturing delivers a strategic message for stakeholders to continuously protect Batam's international industrial competitiveness, the rising contributions of the construction and hospitality sectors offer a promising outlook. They signify that Batam is steadily transitioning toward a more balanced, resilient economic structure one that relies not only on volatile physical exports but also capitalizes on robust domestic consumption and regional tourism appeal.

Conclusion

This study shows that the industrial, construction, and hospitality sectors assume an crucial part for supporting the economic development in Batam City. Empirical findings confirm all the proposed hypotheses, indicating that the manufacturing sector remains the main driver of regional economic output. At the same time, the interaction between industrial activities, ongoing infrastructure development, and the expansion of the service sector contributes to a more adaptive and stable regional economy. The results also indicate that regional development should not rely solely on industrial performance. A balanced expansion between the secondary and tertiary sectors is necessary to strengthen economic resilience against external pressures. Therefore, local governments are expected to continue encouraging investment in the manufacturing sector while improving the quality and efficiency of public infrastructure to support sustainable economic growth. For future research, a broader observation period and additional variables should be considered to provide a more comprehensive understanding of Batam's economic transformation. Developing sectors such as digital-based economic activities and logistics services can also provide valuable insights into the long-term economic diversification process of the city.

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