



## Applying Keynesian theory to identify determinants of gross regional domestic product: Comparative evidence from Java and Sumatra

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**Abstract:** This paper analyzes the application of Keynesian theory to identify the determinants of Gross Regional Domestic Product (GRDP) in Java and Sumatra. The study utilizes panel data from 2013 to 2023 across 6 provinces in Java and 10 in Sumatra, employing a fixed effects panel regression to assess the impact of regional expenditure, FDI, DDI, and local taxes on GRDP. Findings reveal that all variables significantly affect GRDP in Java, while in Sumatra, FDI does not have a significant effect. Java demonstrates a more substantial impact of regional expenditure and investment on economic growth than Sumatra. This research extends the empirical application of Keynesian theory to the regional context in Indonesia, highlighting structural differences in economic drivers between Java and Sumatra. The results suggest that policy interventions in Sumatra should focus on enhancing infrastructure and investment climate to improve the effectiveness of FDI and government spending.

**Keywords:** GRDP, regional expenditure, FDI, DDI

**Sustainable Development Goals (SDGs):** **SDG 8:** Decent Work and Economic Growth; **SDG 10:** Reduced Inequalities; **SDG 17:** Partnerships for the Goals

## 1. Introduction

Keynes' theory, coined by John Maynard Keynes in his book *The General Theory of Employment, Interest, and Money* (1936), is one of the main foundations in modern macroeconomics. This theory emerged as a critique of classical economics, which believed that markets would naturally reach complete equilibrium through the price mechanism. Keynes argued that in the short run, especially during recessions or depressions, aggregate demand is often

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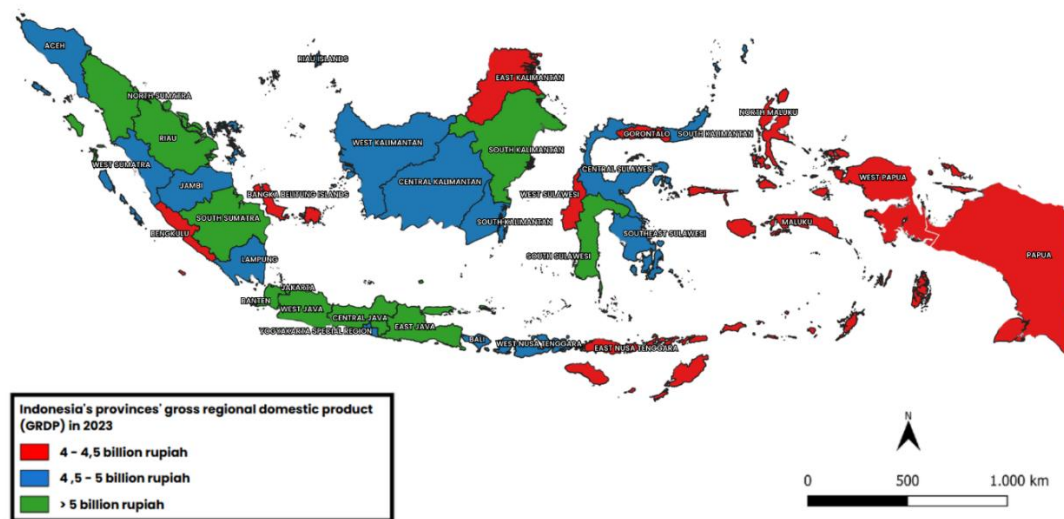


insufficient to absorb the entire production capacity of the economy, resulting in unemployment and underutilization of resources. Therefore, Keynes emphasized the importance of the government's role in stabilizing the economy through active fiscal and monetary policies.

Keynes' theory emerged as an answer to the inadequacies of classical economic theory. This theory became very relevant during economic crises, such as the Great Depression of the 1930s, which became the background of its emergence. Market mechanisms cannot automatically restore the economy to equilibrium during a crisis. A decline in aggregate demand from household consumption, private investment, and exports can deepen the recession through adverse multiplier effects. In such a situation, Keynes recommended active government intervention through expansionary fiscal policies, such as increased public spending (e.g., on infrastructure or social programs) or tax cuts, to boost national income (Degorce & Monnet, 2021; Mool, 2023; Regil, 2021; Trotta Vianna, 2023). A clear example can be seen in the 2008 global financial crisis and the COVID-19 pandemic, where many countries, including Indonesia, implemented fiscal stimulus based on Keynes' theory to recover the economy. In Indonesia, this policy was reflected in social assistance programs, MSME incentives, and infrastructure financing during the pandemic, which proved to help stabilize national income (Feranika & Haryati, 2020).

National income is a complex phenomenon that is the primary focus of regional economic development studies in Indonesia. National income is a common way to measure how well a region is performing. It can also show how much the community's economic activities have increased the overall income. One regional measure used to measure a region's economic development over a specific period is the Gross Regional Domestic Product (GRDP) (Rambe & Febriani, 2020). Gross regional domestic product growth in different provinces shows significant variation, influenced by investment, consumption, and government policies. Monitoring changes in gross regional domestic product is crucial to understanding economic conditions and structural shifts in the regional economy, as well as assisting the government in formulating more effective economic policies (Fabian Crisandy, 2024; Ivonia Auxiliadora Freitas Marcal et al., 2024; Khaffifah, 2025; Saputri & Ananda, 2023; Sari, 2023).

**Figure 1. Map of Indonesia's gross regional domestic product by province**



Source: Indonesia Central Bureau of Statistics, 2023

Figure 1 shows Indonesia's provinces' gross regional domestic product (GRDP) in 2023. There are significant differences in economic levels between provinces in Indonesia. The Java region stands out as the region with the highest GRDP, as it is the economic center of Indonesia, supported by advanced infrastructure, industrial concentration, government centers, and dense population. Apart from Java, the Sumatra region also has a high GRDP, which is driven by its wealth of natural resources, especially oil, gas, and plantations. On the other hand, the Papua region has the lowest GRDP as the region faces various challenges, such as inadequate infrastructure, limited access to markets, and dependence on traditional sectors such as agriculture and fisheries. The Java and Sumatra regions are fundamental to the national economic structure, exhibiting unique and dynamic economic development characteristics. Both islands contribute significantly to the national Gross Regional Domestic Product (GRDP), but face different structural challenges and investment dynamics. The four main variables of interest to study in the context of regional economic development are regional

spending, foreign direct investment (FDI), domestic direct investment (DDI), and local taxes. These four variables have a strategic role in driving regional national income, creating a multiplier effect, and influencing the structural dynamics of the regional economy (Megasari, 2020).

## 2. Literature review

Various efforts have been made to increase gross regional domestic product (GRDP), such as through local spending, foreign investment (FDI), domestic investment (DDI), and tax revenue. The influence of these factors on GRDP in Java and Sumatra is not fully understood. The Keynesian theory developed by John Maynard Keynes offers a comprehensive perspective for analyzing the factors influencing national income. This approach emphasizes the important role of aggregate demand, consisting of government spending and investment, in driving economic activity (Suriadi et al., 2023). This theory is supported by research from (Armawaddin & Nur, 2018; Mega Rosita & Budhi, 2024; Ngo & Phung, 2024; Reza Sebayang et al., 2022). where local expenditure is proven to have a significant positive effect on Gross Regional Domestic Product (GRDP) when local governments allocate funds for infrastructure projects, social programs, or productive sectors, this creates new demand for goods and services. This increased demand drives production, creates jobs, and increases people's income, all of which contribute to the growth of GRDP.

Domestic investment (PMDN) or foreign investment (PMA) is crucial in driving national income. PMA and PMDN provide financial capital and bring technology transfer, human resource capacity building, and employment expansion, all of which contribute to an increase in GRDP (Suhartini, Hailuddin, 2023). In DKI Jakarta, West Nusa Tenggara, and Jambi provinces, both FDI and DDI show a positive and significant influence on national income (GRDP), indicating that investment is an important factor in driving national income in these regions (Lestari et al., 2024; Ningsih et al., 2020; Prakoso, 2023). In Aceh Province, FDI has a positive but insignificant effect on national income, while domestic investment shows an insignificant adverse effect. This indicates that other factors such as political conditions, security, and local economic integration may be more influential in attracting investment and boosting national income in the region (Ramadani et al., 2024). In Jambi Province, PMDN has a negative and significant effect on national income in the short term, while in the long term, PMA shows a significant adverse effect (Ningsih et al., 2020).

Local taxes, taxes are levies imposed by local governments, the value of which varies by country (measured as a percentage of GRDP), and are used to fund about half of public service expenditures at the local level, while the rest generally comes from central government grants (Ferry et al., 2015). Based on research conducted by Rambe (2024) and Rambe & Febriani (2020), taxes significantly positively affect national income because increased taxes can finance infrastructure development and public services, boosting national income. In addition, well-managed taxes can increase investment and consumption, contributing to GRDP growth. Meanwhile, in research (Wicaksono, 2020), local taxes significantly negatively affect national income.

Based on the previous research gap previously described, this study aims to analyze the application of Keynesian Theory in determining the determinants of GRDP, primarily through the variables of regional expenditure, FDI, DDI, and taxes, and compare the influence of these variables between Java and Sumatra regions in order to become a benchmark model for regions whose gross regional domestic product is still low.

## 3. Research method

In this study, the method used to analyze the application of keyness theory in determining the determinants of gross regional domestic product (GRDP): a comparative study of Java and Sumatra is quantitative and uses an explanatory and descriptive approach. This study uses secondary data in the form of panel data obtained from the annual report of the Central Statistics Agency (BPS), and the financial report of the Directorate General of Fiscal Balance (DJPK), from 2013 to 2023, consisting of 6 provinces in the Java region and 10 provinces in the Sumatra region. The dependent variable is each province's gross regional domestic product (GRDP). Gross Regional Domestic Product (GRDP) is one of the crucial indicators in measuring a region's development success level. According to leading economist Simon Kuznets, economic development can be identified when a country can increase its capacity to provide for various economic needs for all levels of society (Astuti, 2025).

In addition, the independent variables in this study consist of: 1) Regional Expenditure, which is all regional obligations recognized as a reduction in the value of net assets in the fiscal year concerned (Rajab, 2024). 2) Foreign Investment (PMA), which is an investment made by foreign parties in a country that aims to buy or invest capital in the form of capital goods and production equipment (Hindarto & Rochaida, 2025). 3) Domestic Investment (PMDN) is an investment made by

individuals or legal entities originating from within the country to invest in specific economic sectors in a region or country (Lestari et al., 2024). Moreover, 4) Local taxes are a source of income for the government to finance various development activities and programs (Rambe, 2024). The data analysis method used in this study is linear regression using panel data, which uses three (3) tests to determine the estimation model: common effect, fixed effect, and random effect using the EViews 12 analysis tool. In this study, to compare economic conditions in the Java and Sumatra regions, we use two panel data regression models, which are formulated as follows:

$$PDRBit = \alpha + \beta_1 BDit + \beta_2 PMAit + \beta_3 PMDNit + \beta_4 Pajakit + \varepsilon \quad (1)$$

The explanation of the variables in the model is as follows: GRDP represents Gross Regional Domestic Product (in billion rupiah), BD is Regional Expenditure (in billion rupiah), PMA represents Foreign Investment (in billion rupiah), PMDN is Domestic Investment (in billion rupiah), and Tax represents Local Tax (in billion rupiah).

#### 4. Research results

Descriptive statistical analysis is a crucial method in research, with the primary purpose of explaining and describing important characteristics of the data collected by researchers. Through this analysis, researchers can provide a clear picture of the attributes and patterns arising from the data, making it easier to understand the conditions and phenomena studied. The analysis results for the two regions of Java and Sumatra are presented in Table 1.

**Table 1: Results of descriptive statistics for Java and Sumatra regions**

Java Region				
	Minimum	Maximum	Mean	Std. Deviation
PDRB	75627.00	2050466	1004193	608501.3
Belanja Daerah	2509.64	66770.61	24686.23	17137.97
PMA	9.700	8283.70	27773.36	2051.36
PMDN	283.80	95202.10	30437.87	23879.10
Pajak	1063.31	43516.48	16827.41	11927.20
Sumatra Region				
	Minimum	Maximum	Mean	Std. Deviation
PDRB	34326.00	602235.9	220744.6	157271.8
Belanja Daerah	1584.86	15787.88	6378.86	3719.43
PMA	19.30	2793.50	512.44	603.18
PMDN	7.80	48243.30	7507.03	8439.59
Pajak	10505.78	10505.78	2555.29	1969.58

Source: Research Data, 2025

The results of descriptive statistics are based on what has been presented in Table 1, which shows the results of descriptive statistics of the Java and Sumatra regions, and there are some significant differences between the two regions. For the Java region with 66 observations, GRDP has a minimum value of 75627.00 and a maximum of 2050466, with an average of 1004193 and a standard deviation of 608501.3. Regional expenditure in Java ranges from 2509.64 to 66770.61, with an average of 24686.23. FDI in the Java region is recorded to have a minimum value of 9,700 and a maximum of 8283.70 with an average of 27773.36, while PMDN ranges from 45.30 to 52302.10 with an average of 30437.87. Tax values in Java range from 1063.31 to 43516.48 with an average of 16827.41.

Meanwhile, for the Sumatra region with 109 observations, GRDP has a lower value than Java, with a minimum of 34326.00, a maximum of 602235.9, and an average of 220744.6. Regional Expenditure in Sumatra ranges from 1584.86 to 15783.85 with an average of 6378.86. FDI in the Sumatra region has a minimum value of 19.50 and a maximum of 2793.50, with a much lower average of 512.44. PMDN in Sumatra ranges from 7.80 to 84343.90 with an average of 5707.03. Finally, the Tax value in Sumatra ranges from 10505.78 to 10505.78 with an average of 2555.29. The comparison shows that the Java region generally has higher economic values than Sumatra, especially in terms of GRDP, FDI, and PMDN. This reflects the inequality of economic development between the two regions.

**Table 2: Determination of the best model**

Jenis Pengujian	Test Result (Prob)	Best Model
Chow Test	0.0000	FEM
Hausman Test	0.0000	FEM

Source: Research Data, 2025

The results of the model determination test that has been carried out show that the best model used to analyze the application of keyness theory in determining the determinants of gross regional domestic product (GRDP): a comparative study of Java and Sumatra is the Fixed Effect Model.

**Table 3: Panel data regression results**

Variabel	Jawa		Sumatera	
	Coef	Prob	Coef	Prob
C	4529	0.0000	1242	0.0000
Belanja Daerah	13.878	0.0000	9.187	0.0000
PMA	19.366	0.0267	6.526	0.1091
PMDN	2.747	0.0002	1.202	0.0000
Pajak	4.238	0.01166	10.002	0.0000
<i>R Squared</i>	0.9944		0.9949	
<i>Adj.R-S</i>	0.9935		0.9943	
<i>F-statistic</i>	1121.65		1450.72	
<i>Prob(F-statistic)</i>	0.0000		0.0000	

Source: Research Data, 2025

The results presented in Table 3 with a significance level of  $\alpha = 5\%$ , the regression results in Java show that the variables of regional expenditure, FDI, PMDN, and taxes significantly positively influence GRDP. Meanwhile, the regression results in Sumatra show that only the variables of regional expenditure, PMDN, and taxes have a positive and significant influence. The remaining FDI variables do not influence GRDP in Sumatra. The probability value (F-statistic) of 0.0000 is smaller than the alpha value of 5%, which means that the indicators of domestic investment (PMDN), foreign investment (PMA), regional expenditure, and taxes together affect the gross regional domestic product (GRDP) (Y) in the Java and Sumatra regions. Overall, the variables studied significantly influence GRDP in the Java region. The Adj R Square value has a value of 0.9935, which means that it can explain the GRDP variable by 99.35 percent, while the remaining 0.65 percent is influenced by other variables not included in the study. While in the Sumatra region, all variables have a positive and significant effect, except for the FDI variable, which is not significant to GRDP in the Sumatra region. Moreover, the Adj R Square value in Sumatra is 0.9943, which means that it can explain the GRDP variable by 99.43 percent, while the remaining 0.57 percent is influenced by other variables that are not observed.

## 5. Discussion of the results

The previous explanation shows that all variables studied in Java significantly influence GRDP in Java. However, in Sumatra, only 3 of the 4 variables studied significantly affect GRDP. The first variable is regional expenditure, which shows that regional expenditure positively and significantly influences GRDP in Java and Sumatra, but with different coefficient values. In Java, the coefficient of regional expenditure is 13.878 with a probability of 0.0000, indicating that every 1 billion increase in regional expenditure will increase GRDP by 13.878 billion. Meanwhile, in Sumatra, the regional expenditure coefficient of 9.187 with a probability of 0.0000 indicates that every 1 billion increase in regional expenditure will increase GRDP by 9.187 billion. This is in line with the theory put forward by Keynes, which states that government spending will impact the development of the domestic economy. The results of this study are the same as research (Armawaddin & Nur, 2018; Mega Rosita & Budhi, 2024; Ngo & Phung, 2024; Reza Sebayang et al., 2022) where when local governments allocate funds for infrastructure projects, social programs, or productive sectors, this creates new demand for goods and services. This increased demand drives production, creates jobs, and increases people's income, contributing to GRDP growth.

Although both regions show a positive influence, the magnitude of the coefficient in Java is higher than in Sumatra, indicating that the impact of regional expenditure on GRDP is greater in Java. In comparison, the effect of regional expenditure on GRDP in Java is greater than in Sumatra. This indicates that the effectiveness of government budget utilization in driving national income in Java is relatively higher. This difference in effectiveness may be due to factors such as better infrastructure availability in Java, higher population density, or a more complex and integrated economic structure in Java. These factors allow the multiplier effect of regional spending to work more optimally in Java than in Sumatra.

The second variable is foreign investment (FDI), which shows a positive and significant effect on GRDP in Java, while Sumatra has no significant effect. In Java, the coefficient of FDI is 19.366 with

a probability of 0.0267, which means that when there is an increase in FDI of 1 billion, it will increase GRDP by 19.366 billion in Java. This is in line with research (Lestari et al., 2024; Ningsih et al., 2020; Prakoso, 2023) The difference in results between Java and Sumatra is because foreign investment is absorbed more in the urban sector such as the food industry and transportation, not the primary sector which has a broader impact. In addition, constraints such as low human resource quality, inadequate infrastructure, and weak bureaucracy and legal certainty also hamper the effectiveness of foreign investment in driving economic growth in Sumatra (Husen & Armansyah, 2020; Sinaga et al., 2025). Thus, FDI is an important factor in driving national income in Java, but its influence is not as strong in Sumatra as in Java.

The third variable, PMDN, positively and significantly affects GRDP in Java and Sumatra. In Java, the PMDN coefficient is 2.747 with a probability of 0.0002, while Sumatra is 1.202 with a probability of 0.0000. This means that when there is an increase in FDI by a billion, it will significantly increase GRDP by 2,747 billion in Java, while in Sumatra, it is only 1,202 billion. This is in line with research (Lestari et al., 2024; Ningsih et al., 2020; Prakoso, 2023) where other factors such as political conditions, security, and local economic integration may be more influential in attracting investment and driving national income in the region. Similar to regional expenditure, the PMDN variable also shows that both regions have a positive effect, but the coefficient in Java is higher than that in Sumatra. This effect indicates that the effectiveness and efficiency of PMDN investment utilization in Java are relatively better than those in Sumatra. This may be due to several factors, such as more adequate infrastructure, availability of more qualified human resources, and a more mature industrial ecosystem in Java compared to Sumatra.

Nevertheless, the significance of the positive effect of FDI in both regions indicates that domestic investment remains an important factor in driving regional national income in both Java and Sumatra. The last variable, tax, also has a positive and significant effect on GRDP in Java and Sumatra, with different characteristics. In Java, taxes have a coefficient of 4.238 with a probability of 0.01166, while in Sumatra the tax coefficient shows a higher number of 10.002 with a probability of 0.0000, which means that when there is an increase in taxes of 1 billion it will increase GRDP by 4.238 billion in Java, while in Sumatra it is higher by 10.002 billion. This aligns with research (Rambe, 2024) where well-managed taxes can increase investment and consumption, contributing to GRDP growth. Although taxes positively influence both regions, the impact is greater in Sumatra than in Java. This suggests that the effectiveness of tax funds in driving national income in Sumatra is relatively higher than in Java. This phenomenon may occur because Sumatra still has greater development potential, so allocating tax funds for infrastructure development and public facilities significantly impacts national income. Nevertheless, tax remains an effective fiscal instrument in driving GRDP growth in both regions, which is reflected in the significance of the effect.

## 6. Conclusions and suggestions

This study demonstrates that while regional expenditure, domestic investment, and local taxes significantly drive GRDP in Java and Sumatra, FDI is only effective in Java. These findings underscore the need for targeted policy interventions in Sumatra, particularly in improving infrastructure and investment climate to harness the benefits of FDI. Theoretically, policymakers should prioritize projects with direct economic impacts and foster an environment conducive to domestic and foreign investment. Scientifically, the research highlights the importance of regional context in applying macroeconomic theories. Limitations include excluding labor and fiscal policy variables, which future research should address to provide a more comprehensive understanding of GRDP determinants.

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