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Analysis of the Influence of Capital Expenditure and Human Development Index on Per Capita Income: Evidence from City Regency Panel Data in Aceh, Indonesia

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ABSTRACT
This study aims to analyze the effect of capital expenditure and the human development index (HDI) on per capita income in Aceh Province, using panel data from 23 districts/cities during the period 2011–2023. The analysis method used is panel data regression with the Fixed Effect Model (FEM) approach, which was selected based on the results of the Chow and Hausman test. The results show that capital expenditure has a positive and significant effect on per capita income, indicating that the effectiveness of the allocation of this expenditure is optimal in driving local economic growth. Likewise, the HDI has a positive and significant effect, indicating that improving the quality of education, health, and people's living standards contributes significantly to increasing per capita income. These findings emphasize the synergy between physical development through capital expenditure and human development through increasing the HDI to drive inclusive and sustainable economic growth in Aceh Province.

Keywords: Income Per Capita, Capital Expenditure, Human Development Index, Panel Regression.

I. Introduction

Economic growth is an important indicator in measuring a country's economic performance. One of the primary measures often used to reflect the level of community welfare is per capita income. According to Todaro & Smitch, (2015)Per capita income is the result of dividing a country's Gross Domestic Product (GDP) by its population in a specific period. This indicator provides an overview of the average income received by each individual. It is often used to classify a country's prosperity level as a low, middle, or high-income country. Per capita income is also one of the benchmarks in determining the success of economic development. Increasing per capita income is expected to directly impact improving people's standard of living, access to education, health services, and quality of life in general. (Sukirno, 2016). Therefore, the government must understand the factors influencing per capita income to formulate appropriate policies to encourage inclusive and sustainable economic growth.

However, the increase in per capita income does not always reflect an even income distribution. In some cases, a handful of groups only enjoy high economic growth, while most remain impoverished. This indicates the need for further analysis of the determinants of per capita income, including investment factors,

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education, government spending, and the human development index. (Huda & Mulyadi, 2019). In Aceh Province, although special autonomy funds (Otsus) have continued to flow since 2008, the level of per capita income in several districts/cities tends to stagnate or decline due to the less-than-optimal utilization of capital expenditures and the less-than-optimal contribution of the productive sector to regional GRDP. (BPS Aceh, 2024). In addition, weak economic competitiveness, dependence on the government sector, and low private investment have worsened the conditions based on information (Kementerian Keuangan RI, 2023). Other structural problems, such as the low quality of human resources as reflected in the HDI value, also impact labor productivity and community income, according to (Bappeda Aceh, 2023b). According to Bank Indonesia (2023), Low real economic activity and uneven distribution of development results are obstacles to improving the welfare of the Acehnese people. This is reinforced by LPEM FEB UI (2024) research, which shows that development inequality between regions in Aceh increases income disparities, which ultimately suppresses overall per capita income.

Conceptually, it can be stated that the more developed a country's economy is, the higher its national income will be, both overall and per person (provided that the growth is faster than population growth). The amount of national income per person is also often used as a benchmark to assess the level of welfare of the population in a country. However, this measure is not the only way to measure welfare. This is because the welfare of society is not solely determined by the figure of national income per person, but also by how it is distributed. Indonesia's experience before the crisis showed that national income per person had reached US $ 1,600, but the number of truly prosperous people was minimal. In Indonesia, income per person is still considered low because there are still many people who are unemployed and work with irregular jobs to meet their daily needs. Planning is essential in formulating budget policies, especially in improving the quality of government spending from the perspective of effectiveness and efficiency, so that it can impact a more efficient State Budget (APBN). However, the reallocation of spending due to changes in capital spending priorities in ministries/institutions (K/L) poses challenges to managing public assets, or State Property. (Nurhani & Zen, 2023). However, it is necessary to identify the accuracy of budgeting by the government to measure the extent to which the budget realization value at the end of the year deviates from the planned, budgeted, or revised value during the same budget year. (Tran & Noguchi, 2020).

Implementing Regional Autonomy in implementing regional autonomy is characterized by fiscal decentralization, which indicates the transfer of authority from the central government to regional governments to regulate their regions independently. With regional autonomy, autonomous regions are expected to obtain rights, authority, and responsibility in handling government issues and the local community's interests. Therefore, regional governments can maximize regional potential and are given the right to manage existing resources in the region efficiently and effectively to improve their financial performance and achieve the independence of autonomous regions. It is hoped that each autonomous region can improve the quality of service in various sectors, especially in public services. In order to improve public services, regional governments need to budget several funds in the form of capital expenditure budgets listed in the Regional Revenue and Expenditure Budget (APBD) to increase regional fixed assets. (Permatasari & Mildawati, 2018).

Capital expenditure is an important component in regional government spending used to finance fixed assets such as infrastructure development, public facilities, and long-term investments supporting economic growth. A decline in capital expenditure in general can indicate fiscal constraints, low budget efficiency, or policy priorities that tend to be more towards operational spending than development investment. (Permana & Susilowati, 2023). In Aceh Province, capital expenditure has tended to decline in recent years, especially after the decline in the allocation of Special Autonomy Funds, which are the mainstay in financing development. (Kementerian Keuangan RI, 2023). This condition impacts the slow development of basic infrastructure and regional connectivity, thus affecting the competitiveness of the regional economy. (Bank Indonesia, 2023). The low realization of capital expenditure also indicates problems in budget planning and implementation, such as weak institutional capacity and low absorption of APBK. (Bappeda Aceh, 2023).

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According to LPM FEB UI, (2024) Sub-optimal capital expenditure in Aceh causes a weak economic multiplier effect and cannot create long-term economic growth evenly across all districts/cities. Regional expenditure is all the regional government spends in one budget year, including the costs required to run government programs. It is important to pay attention to the composition of regional expenditure to support the needs of public facilities, so that it can increase public trust in the performance of the local government. If public trust increases, this will positively impact the community's contribution to paying regional taxes, one source of regional original income. Therefore, to improve public services, there needs to be a change in the allocation of regional spending. If previously more was allocated for apparatus spending, it should focus more on capital spending to improve public services. This change in allocation also aims to improve facilities that can encourage community economic activity, ultimately attracting more investment in the region. To improve public service facilities, the government should allocate a larger budget in the form of capital expenditure in the APBD (Priatna & Purwadinata, 2019). The use of resources in the capital expenditure budget aims to meet the community's needs for public facilities provided by the local government. Therefore, the local government budgets funds in the form of capital expenditures in the APBD to increase fixed assets. The placement of this capital expenditure is determined by the region's need for public facilities to support the implementation of government duties and for the convenience of the community. (Utary, 2021). The statement from Mardiasmo & Djokowijono, (2018) It also concluded that capital expenditure functions as a development instrument, especially in improving public services, strengthening infrastructure, and encouraging regional economic growth.

The Human Development Index (HDI) is a composite indicator used to measure human development achievements from three basic factors: longevity and healthy living, knowledge, and a decent standard of living. A decline or stagnation in the HDI indicates that human development in a region is experiencing obstacles in education, health, and the economy. In Aceh, although the HDI continues to increase on average, several districts/cities are still below the national average, especially remote and interior areas. (Badan Pusat Statistik Provinsi Aceh, 2024). The low HDI in the area is due to limited access to quality education and health services, as well as relatively high poverty rates. (Bappeda Aceh, 2023). In addition, the effectiveness of human development policies that are still short-term oriented is also an obstacle to sustainably improving the community's quality of life. (UNDP Indonesia, 2023). The Bank Dunia, (2023)It stated that increasing the HDI must align with investment in the quality of public services and empowering the local economy to create sustainable productivity. In the context of the Aceh region, (LPEM FEB UI, 2024) Noted that the disparity in development between regions impacts the imbalance in achieving the Human Development Index, which ultimately affects the community's productivity and per capita income.

HDI is used to assess the success of human life and to measure the achievement of human development using various basic components of quality of life. HDI is developed through three main factors as an indicator of the quality of life. Namely, longevity and health, knowledge, and a decent standard of living. Each factor has an indicator that represents it. The life expectancy at birth indicates longevity and health factors. Meanwhile, the indicator that reflects the knowledge factor consists of the average length of education and the expected length of schooling. Finally, the adjusted per capita expenditure indicator represents Indonesia's decent standard of living (Badan Pusat Statistik, 2018). Figure 1 shows the average per capita income data in 23 districts/cities in Aceh Province from 2019 to 2023. In general, there is an income gap between regions. Several areas, such as Banda Aceh City, Lhokseumawe City, and Subulussalam City, show a much higher per capita income than other districts. This shows that urban areas tend to have higher economic activity, which can directly impact increasing people's income. On the other hand, several areas such as Aceh Singkil Regency, Southwest Aceh, and South Aceh are recorded as having relatively low per capita income. This condition is likely caused by limited infrastructure, low investment, or the dominance of less productive primary economic sectors. This gap reflects differences in development and economic capacity between regions. Therefore, regional and central governments need more attention to formulating inclusive and equitable development policies. An equitable development approach, such as increasing capital expenditure

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and strengthening the human development index (HDI), is expected to encourage increased per capita income in lagging areas.

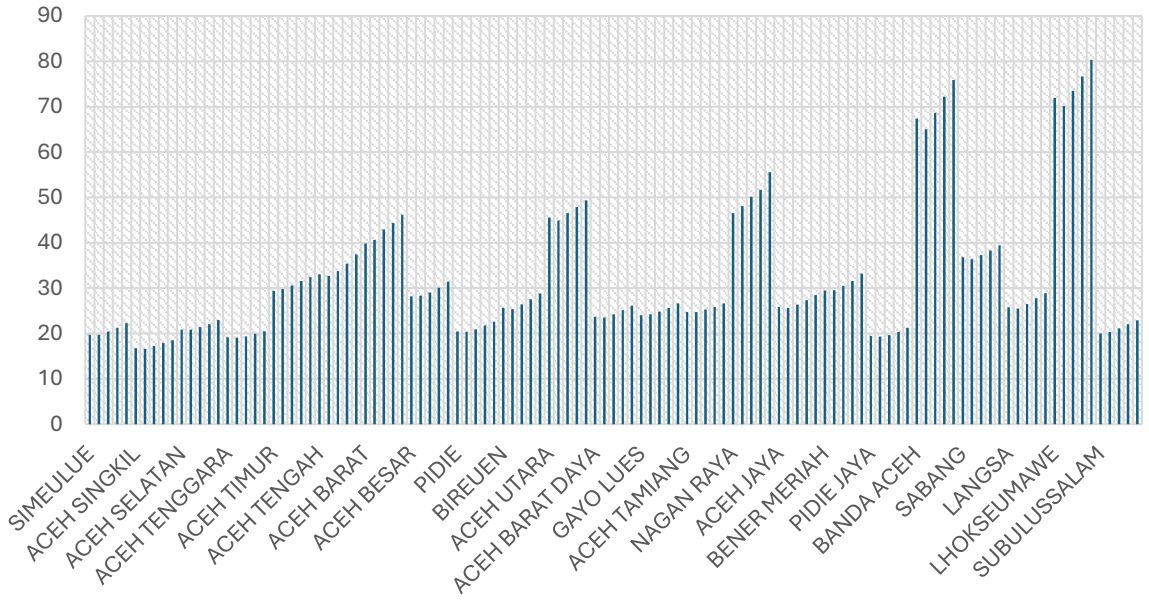

Figure 1. Per Capita Income Data 2019-2023

Although the Aceh provincial budget tends to be high yearly, it has not been successfully translated into sustainable, productive economic activities. The community's dependence on the informal sector and social assistance is one indicator that government spending has not been able to create a strong economic structure. In this context, it is necessary to analyze in depth the factors that cause stagnation of per capita income in Aceh, including the ineffectiveness of capital spending, low absorption of formal labor, and inequality between regions. Moreover, the common problems in capital spending in Aceh are low budget realization, not being on target, inequality in allocation between regions, and minimal impact on increasing the Human Development Index (HDI) and per capita income. The infrastructure that is built often does not support the productive sector of the community and is not optimally maintained. This situation shows a gap between the budget and development. Aceh Province has the largest budget in Indonesia because it has received Special Autonomy Funds (DOKA) since 2008. However, the high budget allocation has not been optimally managed to significantly increase the education, health, and community economic sectors. This indicates structural and implementation problems in Aceh's human development. In the context of Aceh Province, research by Fitriani & Irawan, (2019) Capital expenditure and HDI are significantly related to increasing per capita income in several districts/cities. However, they also noted that the effectiveness of capital expenditure depends on the quality of governance and development planning carried out by the local government. In addition, a study by Syafruddin & Maulana, (2022) There were significant differences between regions regarding per capita income in Aceh Province. This is related to the differences in capital expenditure and HDI levels between districts/cities, which are of concern in efforts for more equitable development. Thus, based on these findings, it can be concluded that capital expenditure and HDI are two important variables influencing per capita income levels. This study will deepen the analysis by using a panel data regression approach to see the influence of simultaneously on 23 districts/cities in Aceh Province from 2011 to 2023.

II. Literature Review and Hypothesis Development

Research on factors that influence per capita income has been widely conducted by various parties, especially in the context of regional development. Capital expenditure, as one of the regional fiscal instruments, is believed to influence economic growth and community income significantly. According to

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Permana & Susilowati (2023), Capital expenditure focused on infrastructure development can increase the efficiency of the distribution of goods and services, and encourage increased regional economic activity. In the context of Aceh Province, the Kementerian Keuangan RI (2023) noted that the decrease in capital expenditure in the APBK structure impacted slow regional economic growth and less than optimal improvement in community welfare. In addition to capital expenditure, human development is an important aspect that contributes to increasing per capita income. A high HDI reflects the quality of education, health, and good living standards, which indirectly encourage labor productivity. The Bank Dunia (2023). Inclusive and sustainable human development drives long-term economic growth. UNDP Indonesia (2023) also emphasized that investment in the education and health sectors positively increases individual capacity and household income. Several studies have examined the relationship between these variables in the context of Aceh Province. For example, LPEM FEB UI (2024) research shows that the inequality of capital expenditure and HDI achievement between regions in Aceh is the main factor causing inequality in per capita income. Meanwhile, Bappeda Aceh (2023), Low HDI in several districts/cities correlates with high poverty rates and low regional competitiveness. Based on these findings, it can be concluded that capital expenditure and the human development index are two important variables that need to be analyzed simultaneously to increase per capita income, especially in Aceh Province. By understanding the relationship between the three, local governments are expected to be able to formulate more effective, efficient, and long-term-oriented development policies.

2.1. Relationship between capital expenditure and per capita income

According to research by Sari & Rahayu, (2020) Shows that capital expenditure has a positive or significant effect on per capita income in several provinces in Indonesia. These results indicate that capital expenditure that is managed efficiently can boost the economic performance of regions/areas. The Aceh province is a region in Indonesia with unique economic characteristics, including the receipt of special autonomy funds and significant expenditures for capital expenditures in the Regional Revenue and Expenditure Budget (APBD). Capital expenditure refers to money the government spends to fund infrastructure projects and other permanent assets that can increase the community's economic productivity. On the other hand, per capita income is an economic measure that shows the average income residents earn in an area for a year. Based on expenditures from the Aceh regional government, it is not only intended to support local government activities. However, it is also expected to create more jobs and spur economic growth. Capital expenditure in the realization of the regional budget aims to purchase or build fixed assets that are useful for more than one year, such as machinery and equipment, buildings, roads, irrigation systems, and other fixed assets. In addition, local government spending on capital expenditure is also an investment that is expected to open up more job opportunities. (Amri & Aimon, 2017).

2.2. The relationship between the human development index and per capita income

The Human Development Index (HDI) is a measure that describes the level of community welfare in an area, based on three main factors, namely health (life expectancy), education (average length of education and expected duration of education), and a sufficient standard of living (average income per person). Meanwhile, per capita income shows the average income received by each person in an area, and is often used as an indicator to assess economic welfare. In Aceh Province, there is a strong relationship between HDI and per capita income, because improving the quality of human resources can encourage economic productivity, which will ultimately contribute to increasing per capita income. (Bappeda Aceh, 2023). Research from Nurhidayat & Maulida, (2021), found that increasing HDI drives per capita income growth, primarily by increasing the average length of schooling and life expectancy.

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III. Research Method

In this study, the quantitative approach is used to collect secondary data. The data used is panel data, consisting of time series data for 2011 to 2023 (n = 13), and cross-sectional data from 23 districts/cities throughout Aceh. This data was obtained from reports issued by the Indonesian Ministry of Finance, BPS districts/cities in Aceh, BAPPEDA Aceh, and other sources that provide accurate data. The variables in this study include per capita income, capital expenditure, and human development index. Per capita income is the total income received in each district/city during the period, which is expressed in units (millions of rupiah). Meanwhile, capital expenditure describes the realization of capital expenditure of the district/city regional government in the relevant year, which is calculated in units (rupiah per capita). On the other hand, the human development index is a benchmark used to assess the level of human progress in each district/city in a given year, which is expressed in units (points). Panel data regression analysis is used to analyze the influence of capital expenditure and development index on per capita income in districts/cities in Aceh. Panel data regression analysis applied to determine per capita income using two variables is formulated in the following equation:

$$\mathbf{PDP_{it} = \beta_0 + \beta_1 BM_{it} + \beta_2 IPM_{it} + e_{it}}$$

β_0 is a constant value; PDPit indicates Per Capita Income in each district/city i in year t; BMit is Capital Expenditure in each district/city i in year t; IPMit represents the Human Development Index in each district/city i in year t; β_1 and β_2 are the regression coefficients for BMit and IPMit; i indicates District/city; t is Year; and e is Error Term. Since each variable has a non-uniform impact, the data for each variable is transformed into logarithmic form. As a result, the equation above is adjusted to the equation below:

$$\mathbf{LogPDP_{it} = \beta_0 + \beta_1 LogBM_{it} + \beta_2 IPM_{it} + e_{it}}$$

β0 is a constant value; LogPDPit represents the Log of per capita income for district/city i in year t; LogBMit is the Log of Capital Expenditure in district/city i in year t; IPMit shows the Human Development Index in district/city I in year t; β1 and β2 are the regression coefficients for LogBMit and IPMit; i represents district/city; t represents year; and e is the Error Term. In panel data regression analysis, there are three main approaches: the Common Effect model, the Fixed Effect model, and the Random Effect model. The Chow and Hausman tests determine which model is most accurate in estimating the effect of capital expenditure and the human development index on per capita income. The Chow test functions to choose between the Common Effect model and the Fixed Effect model, finding out which is better. Meanwhile, the Hausman test compares the Fixed and Random Effect models to find the most appropriate method.

IV. Results and Discussion

4.1. Statistical Result

The level of capital expenditure, quality of life (HDI), and average income of residents in each region of Aceh are not uniform. This inequality is seen between districts/cities and occasionally in the same region. In 2023, Lhokseumawe recorded the highest per capita income (IDR 80.38 million), followed by Banda Aceh (IDR 76.00 million) and Nagan Raya (IDR 56.00 million). Meanwhile, Aceh Singkil had the lowest per capita income (IDR 12.23 million), followed by Pidie Jaya (IDR 14.00 million) and Subulussalam (IDR 14.53 million). For the allocation of Capital Expenditure in the same year, Sabang led with the highest figure (Rp. 6,756,587.00), then Subulussalam (Rp. 4,880,000.00) and Gayo Lues (Rp. 4,580,000.00). On the other hand, Pidie recorded the lowest Capital Expenditure (Rp. 668,730.80), followed by Banda Aceh (Rp. 1,750,000.60) and Aceh Besar (Rp. 1,950,000.00).

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Significant differences exist in the allocation of capital expenditure, quality of human resources (HDI), and per capita income levels between regions in Aceh. These differences are not only at the district/city level, but also in one similar region, at different times. In 2023, Lhokseumawe is the region with the highest per capita income, reaching (Rp. 80.38 million), followed by Banda Aceh with (Rp. 76.00 million) and Nagan Raya with (Rp. 56.00 million). Meanwhile, Aceh Singkil has the lowest per capita income with (Rp. 12.23 million), followed by Pidie Jaya with (Rp. 14.00 million) and Subulussalam, which reached (Rp. 14.53 million). Still in the same year, Sabang was recorded as the region with the largest Capital Expenditure allocation, namely (Rp. 6,756,587.00), followed by Subulussalam (Rp. 4,880,000.00) and Gayo Lues (Rp. 4,580,000.00). On the other hand, Pidie became the region with the smallest Capital Expenditure, namely (Rp. 668,730.80), then Banda Aceh (Rp. 1,750,000.60) and Aceh Besar, which reached (Rp. 1,950,000.00). Furthermore, in 2023, the region with the highest human development index is Banda Aceh (86.69 points), followed by Lhokseumawe (78.90 points) and Langsa in third place (78.40 points). A more detailed explanation of the results of descriptive statistics and the relationship between variables is presented in Table 1.

Table 1. Descriptive Statistics and Correlation between Variables

Statistical Parameters	Per Capita Income (Millions of Rupiah Per Capita)	Capital Expenditure (Rupiah Per Capita)	Human Development Index (Points)
Mean	28,37	1.188.063,00	69,60
Maximum	80,38	6.756.587,00	86,69
Minimum	12,23	668.730,00	59,34
Std. Dev.	13,92	928.365,80	5,060
Observations	299	299	299
Correlation Coefficient			
Per Capita Income (Millions of Rupiah)	1,000	-0,069	0,672
Capital Expenditure (Rupiah Per Capita)	-0,069	1,000	-0,107
Human Development Index (Points)	0,672	-0,107	1,000

Table 1 presents the results of descriptive statistics of the research variables consisting of Per Capita Income, Per Capita Capital Expenditure, and Human Development Index (HDI). The average per-capita income in Aceh Province during the observation period was Rp. 28.37 million, with a maximum value of Rp. 80.38 million and a minimum value of Rp. 12.23 million. The standard deviation of (Rp. 13.92 million) indicates that there is quite a significant variation between regions and time. The average per capita Capital Expenditure was (Rp. 1,188,063.00), with a maximum value reaching (Rp. 6,756,587.00) and a minimum value of (Rp. 668,730.00). The standard deviation of (Rp. 928,865.80) indicates that there is quite a significant difference in capital expenditure between districts/cities in Aceh Province. Meanwhile, the Human Development Index (HDI) has an average value of 69.60 points, with a maximum value of 86.69 points and a minimum of 59.34 points. The standard deviation of the HDI is 5.060, indicating differences in human development between regions in Aceh.

Table 1 also shows the correlation coefficient between the research variables. The correlation coefficient value shows the direction and strength of the relationship between variables, such as Per Capita Income and Capital Expenditure per Capita, which have a negative correlation of (-0.069), which means the relationship between the two is very weak and in the opposite direction. However, this relationship is almost statistically insignificant because the value is minimal. Per Capita Income and Human Development Index have a positive correlation of 0.672, indicating a relatively strong and unidirectional relationship. This means that the higher the Human Development Index of a region, the higher the per capita income tends to be. Per Capita Capital Expenditure and Human Development Index have a negative correlation of (-0.107), which

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means the relationship between these two variables is very weak and in the opposite direction. This relationship is also not statistically significant.

The results of the descriptive statistics above show a reasonably significant variation in capital expenditure and per capita income between regions in Aceh. Meanwhile, the initial correlation analysis shows that HDI has a relatively strong positive relationship to per capita income. In contrast, capital expenditure does not show a significant relationship to per capita income or HDI.

Table 2. Chow Test Results

Effect Test	Statistic	d.f	Prob.
Cross-Section F	1.237,549	(22,274)	0,000
Cross-Section Chi-Square	1.378,036	22	0,000

Based on the results in Table 2, the probability value (p-value) of both types of tests is 0.000, which means it is smaller than the significance level (0.05). This indicates that the null hypothesis (H_0), which states no significant difference between cross-sectional units, is rejected. In other words, there are significant differences in characteristics between individuals (cross-section) in the data, so using a fixed effect model is more appropriate than a standard effect model. The fixed effect model allows for controlling for unobserved but constant individual-specific factors over time, which, if ignored, can lead to biased (inaccurate) estimation results. After conducting the Chow test, which showed that the fixed effect model was more appropriate than the common effect, the next step was conducting the Hausman test. This test determines whether the fixed or random effect model is most appropriate for this study. The results of the Hausman test are presented in Table 3.

Table 3. Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross-Section Random	0,849	2	0,653

The Hausman test results indicate no significant difference between the fixed effect and random effect estimators, so the random effect model is more efficient and appropriate for use. This means that the individual variables (cross-section) used in panel data are not significantly correlated with the independent variables in the model. Based on the results shown in Table 3, the Chi-Square statistical value is (0.849) with (df) of (2) and a probability value (p-value) of (0.653). A probability value greater than the significance level ($0.653 > 0.05$) indicates no significant difference between the Fixed Effect and Random Effect model estimates. Thus, the null hypothesis (H_0) states that the Random Effect Model is more appropriate to use or is accepted, while the alternative hypothesis (H_1) is not used or is rejected.

Therefore, the most appropriate panel data regression model to be used in this study is the Fixed Effect Model (FEM). This means that the differences in characteristics between districts/cities in Aceh Province are random and do not correlate systematically with the independent variables (capital expenditure and human development index). The Fixed Effect Method model is considered more efficient and precise in estimating the effect of capital expenditure and human development index on per capita income in Aceh Province from 2011 to 2023. To assess the extent to which the random effect regression model can explain the data, a graph compares the actual value, the model's predicted value (fitted), and the residual value (the difference between the actual and the prediction). The graph is presented as follows:

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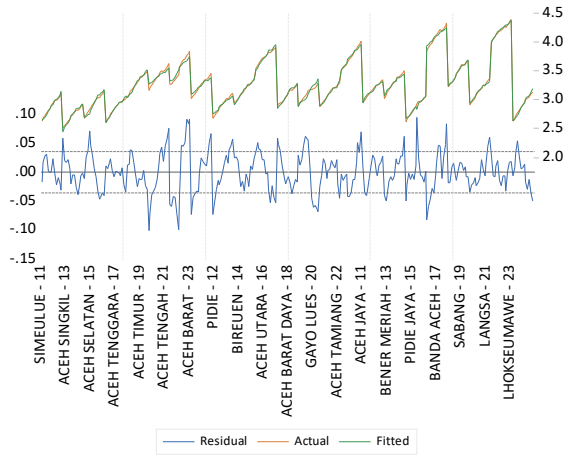
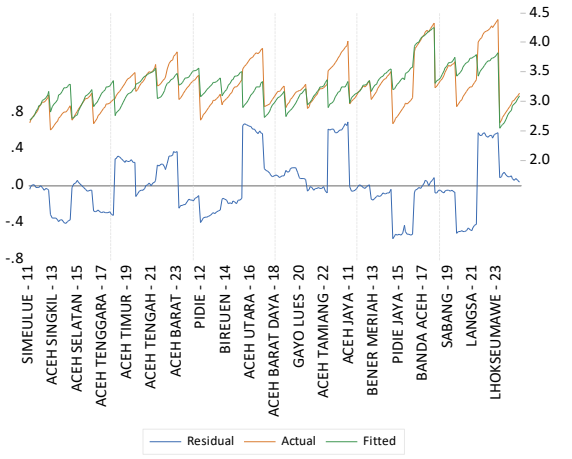


2.1 Fixed Effect Method



2.2 Random Effect Method

Figure 2. Residual Graph

Figure 2 presents residual graphs for two panel data estimation methods, the Fixed and the Random Effect. In residual graph 2.1 (Fixed Effect):

a. The orange line (Actual) and the green line (Fitted) have a close pattern, indicating that the model prediction is relatively good at capturing the direction of movement of the actual data.
b. The blue line (Residual) appears to be randomly spread and fluctuates around the zero line, which is a positive indication that:

    - There is no systematic pattern to the errors.
    - This model meets the white noise (random residual) assumption.
    - There is no firm indication of heteroscedasticity or severe autocorrelation.

c. Some points show larger residual spikes, indicating possible outliers or important variables not included in the model.

Meanwhile, the residual graph 2.2 (Random Effect) shows that:

a. It can be seen that the green (fitted) values still follow the direction of the orange (actual) values, but there are more deviations in some periods.
b. The blue line (Residual) in this model forms a block or jump pattern that tends to repeat itself, indicating the possibility of autocorrelation or an error structure that is not entirely random.
c. The residuals also appear unevenly distributed around zero and exhibit systematic bias, indicating that the model may not optimally capture the data structure.

Based on the two graphs, it can be concluded that the Fixed Effect residual graph shows better visual performance because it has random residuals (Random Effect) and predictions that are close to the actual values. The Random Effect residual graph tends to have patterns in the residuals, which leads to violations of classical assumptions in regression. Therefore, the Fixed Effect residual graph is more reliable in describing the relationship between the variables in this study. The accuracy of predictions in panel data regression analysis is greatly influenced by the fulfillment of classical assumptions, especially the assumption of residual normality and the absence of multicollinearity. Based on the estimation results obtained through EViews, the regression model that tests the effect of capital expenditure and human development index on per capita income has met the residual normality assumption. This is shown in Figure 3.

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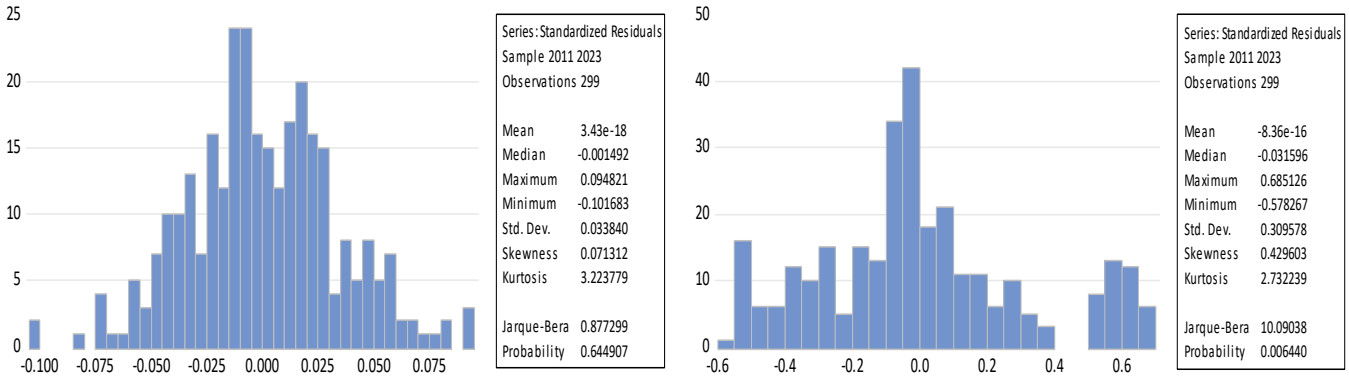

3.1 Fixed Effect Method

3.2 Random Effect Method

Figure 3. Histogram-normality Test

Figure 3 shows the results of the residual normality test through histograms for two panel model estimation methods, namely the Fixed Effect Method and the Random Effect Method. In the histogram graph 3.1 (Fixed Effect), the histogram shows:

a. The residual distribution appears to be approaching a symmetrical shape.
b. The Skewness value is (0.071) and the Kurtosis is (3.22), which is quite close to the normal distribution value (Skewness ≈ 0; Kurtosis ≈ 3).
c. The Jarque-Bera value is (0.877), with a p-value of (0.644), much greater than (0.05).
d. This means insufficient evidence to reject the null hypothesis that the residuals are normally distributed.

In the histogram graph 3.2 (Random Effect), the histogram shows:

a. The residual distribution is not symmetric, with a slight skew to the right.
b. Skewness of (0.429) and Kurtosis (2.73), indicating deviation from normal distribution.
c. The Jarque-Bera value is (10.09), with a p-value of (0.006), smaller than (0.05).
d. This means that the null hypothesis is rejected, and the residuals of this model are not statistically normally distributed.

From the two histograms above, it can be concluded that the best model used is the Fixed Effect histogram, because its residuals are superior in being normally distributed and meeting the classical assumption requirements. While the Random Effect histogram does not pass the normality test, it is less suitable for further statistical decision-making. Thus, the Fixed Effect histogram will be used for regression analysis because it shows better statistical performance, including residual distribution. Multicollinearity testing in the panel data regression model is done by comparing the adjusted R-squared value of the regression results with the correlation coefficient (r) value between the independent variables. The independent variables in this study consist of Capital Expenditure and the Human Development Index. The correlation coefficient value between the two variables is shown in Table 4.

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Table 4. Correlation Coefficient between Variables

	LogPDP	LogBM	IPM
LogPDP	1,000	-0,066	0,671
LogBM	-0,066	1,000	-0,150
IPM	0,671	-0,150	1,000

Table 4 shows that the correlation coefficient value (r) between the variables Log Capital Expenditure (LogBM) and Human Development Index (HDI) is -0.150. This value is smaller than the adjusted R-squared (Adjusted R^2) from the panel data regression results, which reached 0.994. Thus, it can be concluded that there are no symptoms of multicollinearity between the independent variables in the panel regression model used to analyze the effect of LogBM and HDI on Log Income Per Capita.

4.2. Discussion

After testing the panel data regression model with the Chow test, Hausman test, and Lagrange Multiplier (LM) test, it was found that the most appropriate model for this study was the Fixed Effect Method (FEM) Model. This model was selected to obtain efficient and free parameter estimates due to the characteristics of the panel data used, namely, data from 23 districts/cities in Aceh Province from 2011 to 2023. Although the selected model is FEM, the estimation results from the Common Effect (Pooled Least Squares) and Random Effect models are also presented as a comparison to show the differences in results between models. Table 5 below presents the results of panel data regression estimation using the Common Effect Model, Fixed Effect Model, and Random Effect Model. The dependent variable in this model is the log of per capita income, while the independent variables are the log of capital expenditure and the human development index.

Table 5. Panel Regression Results

	DV: LogPercapitaIncome					
	Common effect		**Fixed effect**		**Random effect**	
	Estimated coefficient	**p-value**	**Estimated coefficient**	**p-value**	**Koefisien estimasi**	**p-value**
Constant	-0,865	0,057	-1,467	0,000	-1,464	0,000
Capital Expenditure Log	0,020	0,410	0,008	0,020	0,008	0,019
Human Development Index	0,055	0,000	0,066	0,000	0,066	0,000
R^2	0,452		0,994		0,948	
Udj. R^2	0,448		0,994		0,947	
Ftest	122,27		2081,0		2715,0	
P-value F test	0,000		0,000		0,000	

Table 5 shows the results of panel data regression estimation with three approaches: Common Effect, Fixed Effect, and Random Effect. Based on the results of the Hausman test that has been conducted previously, the most appropriate model used in this study is the Fixed Effect Model (FEM). Therefore, the interpretation will be focused on the results of the FEM model estimation.

$$\mathbf{LogPDP_{it} = -1,467 + 0,008 LogBM_{it} + 0,066 IPM}$$

Capital expenditure positively and significantly affects Aceh's per capita income. This is indicated by the estimated coefficient of (0.008) (P-Value = 0.020 < 0.05). Statistically, this figure shows that every 1% increase in capital expenditure can increase per capita income by 0.008%. Similarly, the Human Development Index (HDI) positively and significantly affects per capita income in Aceh province. This can be seen in the estimated coefficient (0.066) (P-Value = 0.000 <0.05). Statistically, this figure can be interpreted that for every

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1 point increase in the Human Development Index (HDI), per capita income also increases by 0.066% higher than capital expenditure.

Several studies have found that capital expenditure positively and significantly affects per capita income. This shows that government spending on infrastructure and public investment can increase productivity, encourage economic activity in the community, and open up new jobs. In a study in East Kalimantan Province, Sari & Rahayu, (2020) Argued that capital expenditure positively and significantly affects per capita income. Capital expenditure on developing road infrastructure, education, and other public facilities encourages increased productivity and local economic activity. This accelerates regional economic growth, which is reflected in the increase in average community income. At the national level, research by Amri, (2017) States that form government fixed capital originating from capital expenditure significantly affect Indonesia's economic growth. The results of this study confirm that government investment in the public sector will increase national production capacity and trigger growth through a multiplier effect, both in terms of aggregate demand and job creation.

A study conducted by Syamsuddin, (2020) In South Sulawesi, the study strengthens previous findings, stating that capital expenditure by district/city governments has a positive and significant impact on regional economic growth. This is because capital expenditure projects strengthen basic infrastructure and support community economic activities in various sectors, especially agriculture and local trade. Meanwhile, Permana & Susilowati, (2023) Emphasize the importance of capital expenditure effectiveness. Their study of regional financial performance in Indonesia found that targeted and efficiently executed capital expenditure positively and significantly impacted local economic growth. This shows that the amount of allocation, good planning, and implementation determines the success of capital expenditure. The research results on the human development index (HDI) variable in panel data regression also show that HDI has a positive and significant effect on per capita income in Aceh Province. This finding is consistent with various previous studies stating that improving the quality of human resources, as reflected in the HDI, drives economic growth and community welfare. In a study conducted by Huda & Mulyadi, (2019) It was shown that the HDI has a positive and significant impact on per capita income in Indonesia. An increase in the HDI, which reflects improvements in education, health, and living standards, will increase labor productivity and drive economic growth. Likewise, a study by Purbadharmaja & Yasa, (2017) In Bali Province, it was found that the HDI significantly affected per capita GRDP. They explained that when people have better access to education and health, their ability to create economic value also increases. Similar research presented by Putra & Subekti, (2020) Also supports this, where an increase in the HDI has a real impact on increasing per capita income in eastern Indonesia. This shows that improving the community's quality of life is an important factor in regional economic development.

V. Conclusion

Based on the analysis conducted in this study on 23 districts/cities in Aceh Province from 2011 to 2023, it can be concluded that the capital expenditure and human development index (HDI) variables have a positive and significant influence on per capita income. Capital expenditure allocated by the regional government, although in general has not been optimally realized, has contributed to increasing community income. This shows that infrastructure development, such as roads, irrigation, and other public facilities, is still needed to support community economic activities. However, the effect will be more optimal if supported by effective budget planning, efficient realization, and supervision of project implementation. This study confirms that the Human Development Index has a dominant influence over capital expenditure on per capita income. The increase in the HDI, which reflects improvements in education, health, and decent living standards, has been proven to improve people's welfare more directly and sustainably. This means that investment in improving the quality of human resources is an effective strategy to encourage economic growth at the regional level. This condition also shows that a people-centered development approach tends

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to produce a more real impact on increasing people's income than development focusing solely on physical aspects or infrastructure.

Therefore, the regional government in Aceh Province needs to combine physical development strategies through capital expenditure with human development through increasing the Human Development Index in a balanced manner. Budget policies must be directed not only to building facilities and infrastructure, but also to improving the quality of education, expanding access to health, and improving the standard of living of the community as a whole. With an integrated and targeted approach, it is hoped that the per capita income of the Acehnese people can continue to increase, while reducing disparities between regions and realizing inclusive and sustainable economic growth.

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