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THE ROLE OF DOMESTIC INVESTMENT AND HUMAN CAPITAL IN ECONOMIC PERFORMANCE: DOES THE MONETARY AND FISCAL POLICY MIX MATTER?

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ABSTRACT

This study examines the impact of domestic investment and human capital on three key regional economic development challenges—income inequality, poverty, and unemployment—across ten provinces in Sumatra during the period 2010–2023. Using a panel data regression model and moderation regression analysis (MRA), the research also investigates the moderating role of fiscal and monetary policy mixes. The results indicate that domestic investment is significantly and negatively associated with income inequality and unemployment; however, its effect on poverty is statistically insignificant. Human capital, proxied by the Human Development Index (HDI), shows a significant negative effect on both income inequality and poverty, but a significant positive effect on unemployment. Monetary policy, proxied by the BI rate, has a significant positive impact on income inequality and unemployment, with no significant influence on poverty. Additionally, monetary policy is found to weaken the effect of domestic investment in reducing both income inequality and unemployment. Fiscal policy, represented by government spending, has a significant negative effect on poverty and a significant positive effect on unemployment, while showing no significant impact on income inequality. Moreover, fiscal policy strengthens the effect of HDI in reducing inequality and poverty, while simultaneously weakening its effect in increasing unemployment.

Keywords: *Domestic Investment, Human Development Index, Economic Development, Monetary-Fiscal Policy Mix*

ABSTRAK

Penelitian ini menguji dampak investasi domestik dan modal insani dalam mempengaruhi tiga isu pembangunan ekonomi regional yang berlaku di 10 provinsi Sumatera, yaitu ketimpangan pendapatan, kemiskinan dan tingkat pengangguran dalam periode 2010-2023. Kami menerapkan model regresi data panel dan analisis regresi moderasi (MRA) untuk mengetahui peran bauran kebijakan fiskal dan moneter dalam mempengaruhi model. Temuan menunjukkan bahwa Investasi Domestik berhubungan negatif signifikan terhadap ketimpangan pendapatan dan pengangguran namun tidak signifikan terhadap kemiskinan. Modal Insani yang di proksi HDI berpengaruh negatif signifikan terhadap ketimpangan pendapatan, kemiskinan dan berpengaruh positif terhadap pengangguran. Kebijakan

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moneter yang di proksi BI rate berpengaruh positif signifikan terhadap ketimpangan pendapatan, dan pengangguran namun tidak berpengaruh signifikan terhadap kemiskinan. Selain itu kebijakan moneter dapat memperlemah pengaruh investasi terhadap ketimpangan dan juga memperlemah pengaruh investasi terhadap pengangguran. Kebijakan fiskal yang di proksi belanja pemerintah berpengaruh negatif signifikan terhadap kemiskinan dan berpengaruh positif signifikan terhadap pengangguran namun tidak berpengaruh terhadap ketimpangan pendapatan. Selain itu ia mampu memperkuat pengaruh HDI dalam menurunkan ketimpangan dan kemiskinan serta memperlemah pengaruh HDI dalam meningkatkan pengangguran.

Kata Kunci: *Investasi Domestik, Indeks Pembangunan Manusia, Pembangunan Ekonomi, Bauran Kebijakan Moneter-Fiskal*
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Introduction

Economic development issues have always been a prominent topic of discussion among academics and policymakers. Various planning and evaluations in economic development are not only interesting but also crucial as they determine the welfare of every individual. Sustainable development represents an ongoing effort to achieve economic progress. There is a paradigm shift in how development is measured. The classical paradigm generally focuses on industrialization and is growth-oriented, with economic progress being solely assessed through increased output measured by Gross Domestic Product (GDP) (Todaro & Smith, 2015). However, GDP is not an ideal indicator. Frequently, economic growth benefits only a small segment of the population and fails to truly enhance the welfare of all social groups (Maipita, 2014). This has led to a new paradigm in measuring development, which began to emerge in the early 1970s. Economic development is no longer solely measured by output increases but is more focused on the quality of the development process, evaluated by the extent to which it reduces poverty, income inequality, and provides employment opportunities (Mudrajad, 2011).

Today, the Sustainable Development Goals (SDGs) have become the guiding framework for global and national development agendas. The ultimate goal of development is not only to meet present human needs but also to ensure the well-being of future generations (Wirianata, 2023). The urgency of these economic development goals has implications for Indonesia's economy at both national and regional levels. Specifically, these goals are relevant in the context of regional economic studies. Development economics models can generally be applied to regional economies (Tarigan, 2018). Our study examines economic development issues across 10 provinces in Sumatra. This island holds significant economic potential due to its natural resources, yet it continues to struggle with persistent welfare challenges. We explore the extent to which three Sustainable Development Goals (SDGs) have been achieved: eradicating poverty, providing employment opportunities, and reducing inequality.

During the 2023 Regional Consultation on Gross Regional Domestic Product and Socio-Economic Indicators (PDRB-ISE) across Sumatra, *PJ* governor of Bangka Belitung, Suganda, stated that the existence and contribution of Sumatra to the national economy cannot be overlooked. Sumatra is the second-largest contributor after Java. However, the economies of provinces in Sumatra still face challenges such as disparities in economic growth between regions due to inadequate infrastructure, high poverty rates in some areas, and the need for economic transformation as the economy remains reliant on natural resources (Yudhistira, 2023). Disparities in welfare between regions are also evident, as indicated by the Statistics Indonesia (BPS) report, which shows that North Sumatra largely supports Sumatra's economy,

contributing 23.31% to the island's economy (Siahaan, 2023). Sumatra has a comparative advantage in agriculture, mining, excavation, construction, transportation, warehousing, and government administration sectors. However, Sumatra's economy still encounters challenges of poverty, unemployment, and social welfare issues (Bappeda, 2018). Therefore, promoting Sumatra's economy through the development process is crucial and needs to be continuously evaluated. Considering that Sumatra's economy still depends on natural resources, economic transformation seems to be a vital issue. Essentially, economic development involves transforming a stagnant economy towards growth, shifting from low-income to high-income status, and addressing absolute poverty (Todaro & Smith, 2015).

Every province in Sumatra offers distinct investment appeal, with several exhibiting notably high levels of investor attractiveness (Ahmad, 2025), however, certain provinces have received relatively limited capital inflows, as observed in the cases of Bangka Belitung Islands, Bengkulu, and West Sumatra. (Aswiandi, 2025). The role of capital accumulation is undeniably critical and remains a fundamental driver of economic development. Several economists have explained the importance of capital for the economy through their economic models, such as the Harrod-Domar, Cobb-Douglas, Ragnar Nurkse, and Solow models, which emphasize investment as a key factor for economic sustainability. A modern economy requires sufficient capital, which implies the need to reduce current consumption to accumulate enough capital for sustainable production. However, this often becomes an obstacle in underdeveloped economies with low incomes, where the tendency to consume is very high, resulting in low savings and, consequently, low capital accumulation(Samuelson, Paul A. & Nordhaus, 1992).

High-quality human capital is equally important as physical capital. Skilled and capable human resources are crucial for economic sustainability (Samuelson & Nordhaus, 2004). Human resource development has been proven to drive economic progress in developed countries, prompting developing nations to catch up with human development through planned policies (Arsyad, 2016). Amartya Sen first introduced the concept of human development as a capability approach, emphasizing the importance of positioning human quality of life as the ultimate goal, rather than mere economic growth. This highlights the need to focus on education and health aspects (Todaro, 2015).

Government intervention in the form of monetary and fiscal policies plays a key role in managing economic continuity, which tends to fluctuate, known as the business cycle (Sukirno, 2016). Keynes criticized the classical view that over-relied on market mechanisms, with the Great Depression in 1929 proving that the economy needed government intervention (Mudrajad, 2011). Economists implement stabilization policies to mitigate short-term economic fluctuations. These policies involve fiscal and monetary measures that help reduce business cycles by keeping output and employment close to natural levels (Mankiw, 2007a). The involvement of money variables must be considered because they affect various economic variables, making monetary policy a constant focus for policymakers and academics (Mishkin, 2017). In practice, both policies are implemented simultaneously and complement each other in their combination, with the same goal of keeping aggregate demand and total output in line with development objectives. By diversifying policy instruments such as tax determination, government spending, and monetary policies, governments can influence the share of GDP allocated to business investment, consumption, net exports, and the purchase of goods or services (Samuelson & Nordhaus, 1992).

Our study aims to investigate the impact of domestic investment and human capital on economic development performance and estimate the moderating effects of stabilization policies from both monetary and fiscal perspectives. We offer novelty in several areas, with the key economic performance indicators being the three main measures that directly influence the welfare of the population: income inequality, poverty, and unemployment. Our analysis also explores the role of fiscal and monetary policies in shaping economic performance by affecting economic variables. The study's findings are expected to contribute significantly

to the examination of development in the 10 provinces of Sumatra and provide important implications for identifying suitable stabilization policies to support this development process.

Literature Review

Investment and Capital Accumulation

Academics have extensively investigated and produced empirical studies aimed at formulating more equitable economic policies. In theory, domestic investment can have varying impacts, depending on the investment patterns implemented by both the government and private sectors. On one hand, in Romer's (1990) endogenous growth theory, investments in physical and human capital can drive more equitable economic growth, particularly when focused on sectors that absorb labor or projects that benefit all levels of society. However, income inequality may arise if investments are concentrated in sectors that only benefit a few strategically located areas. This is consistent with the views of Modernization Theory by Lewis (1954), which suggests that if investment is concentrated in already developed areas, it will widen the gap between central and regional areas or between the modern and traditional sectors. Empirical studies provide concrete evidence that investment can help reduce income inequality. For example, Ameer et al. (2021) found that investment can enhance income equality, while Lee et al. (2022) discovered that a combination of foreign and domestic funds can help reduce income inequality.

Domestic investment plays a crucial role in driving the economy and has the potential to reduce poverty in a country. Poverty remains a critical issue debated in academic and policy circles. Therefore, Zuraida & Asmara (2024) emphasized the need for strategic and intensive policies to combat poverty. The issue of poverty is critical, as highlighted by Ragnar Nurkse's vicious circle theory, where low productivity stems from market imperfections and limited capital. Low wages set by governments and corporations often prevent workers from meeting their basic needs, classifying them as impoverished (Nurkse, 1953). This theory also implies that poverty is exacerbated by limited capital and restricted access to resources, hindering societal creativity. As a result, job opportunities decline, leading to increased unemployment and ultimately exacerbating poverty. To optimize poverty reduction, investment acts as a fundamental tool to provide production goods aimed of increasing a company's assets and scaling production in terms of quantity and quality. Similarly, Harrod's Dynamic Theory (Harrod, 1939),explains that investment is a key indicator for creating stable and long-term economic growth. This theory suggests that low investment levels, whether foreign or domestic, can negatively impact economic development, reduce household income, and contribute to poverty (Yustika, 2006).

Domestic investment plays a key role in reducing unemployment rates Akhmad et al. (2022). Investment can be a means to create jobs, alleviate poverty, and reduce unemployment through effective fiscal policies. Domestic investment not only reduces unemployment but also enhances labor quality, creating a sustainable and inclusive economic growth cycle (Abdulkarim, 2023). Various empirical studies, such as those by Almula-Dhanoon et al. (2020), Mimi et al. (2022), and Alalawneh & Nessa (2020), explored the relationship between investment and unemployment. These studies concluded that unemployment is a major challenge faced by countries with different economic, social, and political systems.

It is evident that investment and labor aspects are crucial topics in addressing unemployment. Domestic investment can help reduce unemployment by directly creating jobs in complementary industries. Investment can also lead to economic savings for workers through higher real wages and increased production capacity via worker training and education, boosting production efficiency (Saha, 2024). Therefore, government policies aimed at reducing unemployment should focus on economic growth, with the assumption that increased economic growth will broaden employment opportunities (Meo et al., 2023). Economists like Schumpeter & Keynes (1936) also highlighted that increased investment boosts

aggregate demand, driving production and requiring more labor to meet that demand. If the economy is sluggish, fiscal policies, such as increased government spending, can effectively reduce unemployment by stimulating economic activity.

Grounded in the theoretical frameworks proposed by Romer's (1990), Nurkse's (1953), and the model, investment is conceptualized as a pivotal driver of economic capacity expansion, which in turn plays a critical role in mitigating income inequality, poverty, and unemployment.

H1: Domestic Investment has a Negative Impact on Income Inequality
H2: Domestic Investment has a Negative Impact on Poverty
H3: Domestic Investment has a Negative Impact on Unemployment

Human Capital

Human capital theory, first introduced by Schultz (1961) and later developed by Becker (1962), suggests that education levels influence economic growth and can reduce income disparities, as education enhances labor productivity (Hartini, 2015). This implies that high-quality human resources can affect income inequality, impacting economic development. Becker (1962) argued that the Human Development Index (HDI) negatively correlates with inequality. Becker further analyzed the role of formal education in supporting economic growth, stating that the higher the education level attained, the higher labor productivity, which in turn spurs economic growth. Sarkodie & Adams (2020) also noted that income inequality negatively affects three aspects of human resources. For instance, low incomes influence choices related to healthy food, access to modern technology, and quality education.

Several previous studies examined the impact of the Human Development Index on economic growth. Pradana & Sumarsono (2018) stated that a higher HDI positively influences economic growth. As an indicator of economic success, the HDI plays a significant role in illustrating the achievements of human resource development. Cholili (2014) found that the HDI significantly contributes to poverty reduction. Understanding prior research, it is clear that HDI plays a role in addressing poverty, where poverty reduction translates into decreased income inequality. Similarly, Leal (2016) posited that income inequality negatively correlates with the HDI, with rising inequality leading to a decline in the HDI. Theyson & Heller (2015) also found that human development growth, measured by the HDI, reduces income inequality. Thus, enhancing human development quality can contribute to increased income equality, directly influencing poverty reduction.

Poverty is a common challenge faced by countries globally. Several factors contribute to poverty, including low education levels, poor health, limited job opportunities, and isolated living conditions (Hasan, 2021). These factors align with Human Capital Theory, which explains that quality human development can address income disparities and poverty. Many factors can help solve poverty, with human development being one of them. Pradana & Sumarsono (2018) found that higher economic development quality positively impacts economic growth. Numerous studies have discussed the role of human development (HDI) on regional or national economies. Ahmad et al. (2019) found that HDI has a negative and significant impact on poverty, with education being the most dominant dimension of the HDI. Meriyanti (2015) found that HDI programs contribute 35.2% to poverty reduction.

Unemployment has become a growing concern as population growth outpaces job creation. As more people, especially women, enter the labor market, job seekers exceed available opportunities (Taner et al., 2011). Unemployment adversely affects personal well-being, such as declining health and self-esteem, and often leads to suicide, illegal activities (Machin & Manning, 1999) Many scholars have proposed including unemployment in the HDI. Smith (1993) was the first to propose this significant change to the HDI indicator. Incorporating unemployment into the HDI could provide a more comprehensive impact and a better approach for assessing national development performance (Taner et al., 2011). Feng et al. (1970) noted

that individuals with low education levels are less capable of entering modern sectors, which increases unemployment rates. This aligns with Malthus's (1798) theory, which argues that a lack of standardized living conditions hinders development (Aminda et al., 2024). Mahroji & Nurkhasanahn (2019) also found that individuals with low HDI have low purchasing power, reducing business output and failing to absorb the current workforce, leading to increased unemployment due to mismatches in labor demand and supply.

Drawing upon Becker's (1962) human capital theory, the aforementioned empirical evidence, and Malthus's (1798) concerns, human development is projected as a vital factor in improving quality of life and a necessary condition for achieving reductions in inequality, poverty, and unemployment.

H4: The Human Development Index has a Negative Impact on Income Inequality
H5: The Human Development Index has a Negative Impact on Poverty
H6: The Human Development Index has a Negative Impact on Unemployment

Monetary-Fiscal Policy Mix

The equilibrium condition between money supply and demand is essential to achieve. In this case, the central bank does so by controlling the money supply or using the Indonesian Bank (BI) rate instrument. The central bank controls the money supply through open market operations by buying or selling its bonds; when buying, an expansionary monetary policy is applied, and the money supply increases, and vice versa for a contractionary monetary policy. An increase in the money supply will naturally lower interest rates (Blanchard & Jhonson, 2013). Meanwhile, the relationship between monetary policy and the economy is explained in the IS-LM model, where monetary policy affects the balance in the goods and money markets. Keynes' cross theory explains that interest rates are negatively related to investment, as higher rates make the cost of holding money more expensive, resulting in a decrease in income. On the other hand, liquidity preference theory explains the involvement of interest rates in balancing supply and demand in financial markets, determined by the money supply, with a negative relationship between the two (Mankiw, 2007).

The monetary policy implemented by Bank Indonesia has several important objectives, including achieving rupiah stability, maintaining the stability of the payment system, and ensuring financial system stability so that development goals such as sustainable economic growth can be maintained. The goal of achieving rupiah stability means the creation of stable prices for goods and services as well as the rupiah exchange rate(Bank Indonesia, 2023). The critical role of monetary policy in the economy has been proven by several empirical studies. Nguyen (2023) found that expansionary monetary policy supports income inequality reduction through the labor market channel. Monetary expansion reduces inequality more strongly by raising wages and employment. Abdulganiyu A et al. (2023) found that monetary policy is strongly related to poverty reduction, and their study implies the importance of implementing low-inflation monetary policy to encourage investment, expand employment opportunities, and boost economic growth.

Meanwhile, fiscal policy has several examples of application. When the government seeks to reduce the budget deficit by raising taxes and maintaining government spending, it is called fiscal contraction. Conversely, policies that tend to increase the deficit through tax cuts and increased government spending are called fiscal expansion (Blanchard & Jhonson, 2013). Both increased government spending and tax cuts have an impact on the economy, and this relationship is explained in the IS-LM model. An increase in government spending or a reduction in taxes will shift the IS curve to the right, which means both lead to an increase in income. This happens because government spending is one component of GDP, and tax cuts increase disposable income, which then boosts consumption. Moreover, increased government spending and tax cuts create a multiplier effect that further enhances income growth (Mankiw, 2007).

There are three main functions of fiscal policy: the allocation function for development, the distribution function to improve the welfare of all social groups, and the stabilization function to maintain macroeconomic sustainability (Okri Handoko et al., 2023). In practice, fiscal policy is directed toward several public interests, such as spending on goods, capital expenditure, social assistance, and grants. These are intended to meet the needs for goods/ services for government operational purposes, investments to support infrastructure development to boost economic growth, create job opportunities, and alleviate poverty (Azwar, 2016). Several empirical studies have demonstrated the benefits of fiscal policy. Malia & Pathranarakul (2022) found that government size, education, investment and health investment are negatively related to inequality in developed countries. Mokoena & Mazenda (2023) found that health expenditures are significant in reducing multidimensional poverty, which implies the importance of promoting healthcare services and health insurance. Alhaj Yousef (2023) found that an increase in aggregate government expenditure leads to a reduction in unemployment in both the short and long term.

Considering the significant role of the monetary and fiscal policy mix by the government as an intervention to support economic sustainability, these two variables are projected to contribute to the reduction of income inequality, poverty, and unemployment. Furthermore, this policy mix may provide a contingent effect on the variables of domestic investment and human capital.

H_7: Monetary policy is negatively related to income inequality, poverty, and unemployment.
H_8: Monetary policy can moderate the relationship between domestic investment and income inequality, poverty, and unemployment.
H_9: Fiscal policy is negatively related to income inequality, poverty, and unemployment.
H_{10}: Fiscal policy can moderate the relationship between the Human Development Index

Data and Research Methods

This study employs a quantitative approach with panel data involving a sample of 10 provinces on the island of Sumatra from 2010 to 2023. All data are secondary and were obtained through the official websites of the Central Statistics Agency (BPS), provincial BPS offices, and Bank Indonesia. Our model involves two main independent variables, namely Domestic Investment (X1) and Human Capital (X2), control variables including economic growth (C1) and unemployment rate (C2), and two moderation variables, namely Monetary Policy (Z1) and Fiscal Policy (Z2). These variables will be further clarified in the following operational definitions.

Table1: Operational Variable Definition

Variable	Notation	Indicator	Data Source
Income Inequality	GR	*Gini Ratio*	BPS
Poverty	Pov	*Poverty Rate (%)*	BPS
Unemployment Rate	UR	*Unemployment Rate (%)*	BPS
Domestic Investment	ID	*Real Domestic Investment*	BPS
Human Capital	HDI	*Human Development Index*	BPS
Monetary Policy	TB	*BI Rate (%)*	BI
Fiscal Policy	GE	*Real Government Expenditure*	BPS

To achieve the research objectives, a panel data regression model is the appropriate approach in this study because it accommodates both time series and cross-sectional data. Additionally, we apply the moderated regression analysis (MRA) model to estimate the moderating effects of monetary and fiscal policies on the relationship between physical capital and human capital with the three development indicators, namely income inequality, poverty, and unemployment. Consequently, we have developed several equations:

Income Inequality as Dependent Variable:

$$GR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 CEG_{it} + \varepsilon_{it} \quad (1)$$

$$GR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 GE * ID + \beta_5 CEG_{it} + \varepsilon_{it} \quad (2)$$

$$GR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 IR_{it} + \beta_4 IR.ID + \beta_5 CEG_{it} + \varepsilon_{it} \quad (3)$$

$$GR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 IR + + \beta_5 GE * ID + \beta_6 IR.ID + \beta_7 CEG_{it} + \varepsilon_{it} \quad (4)$$

Poverty as DependentVariable:

$$Pov = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 CEG_{it} + \beta_4 CUR_{it} + \varepsilon_{it} \quad (5)$$

$$Pov = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 GE * ID + \beta_5 CEG_{it} + \beta_6 CUR_{it} + \varepsilon_{it} \quad (6)$$

$$Pov = \beta 0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 IR_{it} + \beta_4 IR.ID + \beta_5 CEG_{it} + \beta_6 CUR_{it} + \varepsilon_{it} \quad (7)$$

$$Pov = \beta 0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 IR + \beta_5 GE.ID + \beta_6 IR * ID + \beta_7 CEG_{it} + \beta_8 CUR_{it} + \varepsilon_{it} \quad (8)$$

Unemployment Rate as Dependent Variable:

$$UR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 CEG_{it} + \varepsilon_{it} \quad (9)$$

$$UR = \beta_0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 GE * ID + \beta_5 CEG_{it} + \varepsilon_{it} \quad (10)$$

$$UR = \beta 0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE.ID + \beta_4 CEG_{it} + \varepsilon_{it} \quad (11)$$

$$UR = \beta 0 + \beta_1 ID_{it} + \beta_2 HDI_{it} + \beta_3 GE_{it} + \beta_4 IR + \beta_5 GE.ID + \beta_6 IR * ID + \beta_7 CEG_{it} + \varepsilon_{it} \quad (12)$$

Result and Discussion

Result

Descriptive Statistic

The results of the descriptive statistical test in Table 2 provide information on the Minimum, Maximum, Mean, and Standard Deviation values for each main variable in the research model.

Table 2: Descriptive Statistics Result

Variable	Obs	Mean	Std. Dev.	Median	Minimum	Maximum
GR	138	0.330	0.029	0.330	0.245	0.437
Pov	138	19.243	103.91	19.243	4.52	20.98
UR	138	5.605	1.650	5.605	0.420	10.340
ID	138	6143.9	7960.5	3656.9	0.400	48243.3
HDI	138	71.082	2.502	71.275	64.870	76.460
EG	138	4.393	2.134	4.810	-3.800	7.860
IR	138	5.680	1.291	5.680	3.500	7.500
GE	138	1.95E+09	3.09E+09	12.632.174	1.909	1.26E+10

The table above presents information on the research data. The highest income inequality is 0.437, observed in Riau Islands Province, while the lowest is 0.245 in Bangka Province. With an average of 0.330, the inequality value across the sample is close to the maximum. Conversely, the mean is relatively distant from the standard deviation, indicating that the variance in inequality within the sample is quite large. The highest poverty rate is 20.98%, recorded in Aceh Province, while the lowest is 4.52% in Bangka Belitung Islands Province. With an average of 19.24, the poverty level across the sample is close to the maximum. Similarly, the mean is relatively distant from the standard deviation, indicating substantial variance in poverty levels within the sample. The highest unemployment rate is 10.34% in Riau Islands

Province, while the lowest unemployment rate is 0.42% in Riau Province. With an average of 5.605, the unemployment rate across the sample falls between the minimum and maximum values. Again, the mean is relatively distant from the standard deviation, suggesting a high variance in unemployment rates across the sample.

Correlation Analysis

A correlation analysis was conducted to ensure that there is no correlation among the residuals of the independent variables; this test is also known as the multicollinearity test. No correlation is present if each variable's correlation coefficient has a value lower than 0.85(Widarjono, 2018).

Table 3: Multicollinearity Test Result

Variable	ID	HDI	PE	TB	GE
ID	1				
HDI	0.1855	1			
GE	-0.3154	-0.1148	1		
IR	-0.2738	-0.2637	0.4532	1	
GE	0.0761	0.0172	0.1969	0.2598	1

The table above presents the results of the residual correlation test among the independent variables, including the main variables, control variables, and moderating variables. The correlation coefficients for each variable indicate multicollinearity issues in the data. This suggests that the model constructed in this study meets the ordinary least squares (OLS) criteria regarding the assumption of no correlation issues among independent variables.

Unit Root Test

A unit root test was conducted prior to performing the panel data regression to avoid spurious regression. In this case, the LLC, ADF, and IPS methods were used, and the results indicated that the data is stationary across all three methods. Data that is stationary at the level suggests that the traditional panel data method is more suitable. However, if the data is stationary at the difference level, the dynamic panel data method is more appropriate.

Table 4: Unit Root Test Output

Variable	LLC	ADF	IPS
PE	-810111***	603191***	-488449***
TP	-365447***	566731***	-447326***
Povn	-1065.92***	464375***	-252331***
EL	-142415***	974085***	-848018***
HDI	-695736***	183661***	-471963***
GR	-648935***	575874***	-45362***
JUB	-108977***	698232***	-580392***
TB	-100884***	669264***	-54931***
BP	-386829***	61466***	-501549***
ID	-74215***	612481***	-488447***

The unit root test results above show that the data for all variables are fully stationary at the level stage, indicating that the data is free from spurious regression as noted by Engle & Granger (1987) and Levin et al. (2002). This conclusion is further reinforced by involving the LLC and IPS tests, which are relevant in unit root testing for panel data (Baltagi, 2005). Stationary data at the level stage suggests that differencing is unnecessary, and there is no need for long-term equilibrium estimation (Widarjono, 2018).

Panel Data Estimate Regression

We present the estimation results in three separate tables for each dependent variable, considering the complexity of the tests. Each table presents all four models for each dependent variable:

Table 5: Estimation Result (Income Inequality as Dependent Variable)

Variable	Model			
	[1]	[2]	[3]	[4]
Dependent Variable: Income Inequality				
C	0.608***	0.618***	0.335***	0.597***
	(0.000)	(0.000)	(0.000)	(0.000)
ID	-7.41E-0***	-8.41E-0***	-0.003**	-0.003**
	(0.007)	(0.001)	(0.042)	(0.015)
HDI	-0.003***	-0.004***		-0.003***
	(0.000)	(0.000)		(0.007)
IR			0.003**	0.001
			(0.019)	(0.348)
IR*ID			-1.22E-07**	-6.83E-08
			(0.044)	(0.241)
BP		-1.18E-13		9.92E-12
		(0.238)		(0.593)
GE*HDI		0.002**		-1.37E-13
		(0.000)		(0.602)
PE	0.001**		0.000**	0.000
	(0.030)		(0.044)	(0.517)
Obs	138	138	138	138
R^2	0.2756	0.2961	0.5662	0.6314
Fixed Effect	No	No	Yes	No
Classical Assumption	Yes	Yes	No	Yes

Note: * Significance at 10%, **Significance at 5%, *** Significance at 1%

From the four models tested in Table 5, it is evident that domestic investment consistently has a significant negative impact on income inequality; each increase in domestic capital accumulation reduces inequality. A similar relationship is found with the Human Development Index (HDI), which, across the three test models, consistently shows a significant negative impact on income inequality. In Model 2, government spending does not have a significant effect on income inequality but positively moderates the impact of HDI on inequality. In other words, each increase in government spending enhances the effect of HDI in reducing income inequality. In Model 3, the interest rate has a significant positive impact and negatively moderates the relationship between investment and unemployment, indicating that each increase in the interest rate diminishes the effect of investment on reducing unemployment.

Table 6 presents the estimation results of the model with poverty as the dependent variable. The Human Development Index (HDI) is the main variable that has a significant negative impact on poverty, as shown in Models 2 and 4. Meanwhile, Models 2 and 4 indicate that government spending consistently has a significant negative impact on poverty and is able to moderate the relationship between HDI and poverty. This means that an increase in government spending will strengthen the impact of HDI in reducing poverty. On the other hand, the estimations show that the unemployment rate and economic growth consistently have a significant positive impact on poverty.

Table 6: Estimation Result (Poverty as Dependent Variable)

Variable	Model			
	[1]	[2]	[3]	[4]
	Dependent Variable: Poverty			
C	1.005	-338.35*	0.476	-378.526**
	(0.386)	(0.058)	(0.719)	(0.040)
ID	-6.33E-06	-6.26E-06	6.38E-06	6.57E06
	(0.284)	(0.296)	(0.785)	(0.778)
HDI	0.0108	-1,468*	0.016	-1.661**
	(0.513)	(0.059)	(0.356)	(0.039)
IR			0.003	-0.010
			(0.941)	(0.805)
TB*ID			-2.41E-06	-2.32E-06
			(0.563)	(0.579)
GE		-104.172*		-116.80**
		(0.057)		(0.039)
GE*HDI		104.185*		116.81**
		(0.057)		(0.039)
UR	0.069**	0.085**	0.078**	0.086**
	(0.030)	(0.014)	(0.031)	(0.016)
EG	0.038**	0.040*	0.044**	0.044*
	(0.036)	(0.059)	(0.0449)	(0.060)
Obs	139	139	138	138
R^2	0.0941	0.6102	0.1197	0.1065
Fixed Effect	No	Yes	No	No
Classical Assumption	Yes	No	Yes	Yes

Note: * Significance at 10%, **Significance at 5%, *** Significance at 1%

Table 7: Estimation Result (Unemployment Rate as Dependent Variable)

Variable	Model			
	[1]	[2]	[3]	[4]
	Dependent Variable: Unemployment Rate			
C	3.231	18.37***	6.332***	16.97***
	(0.304)	(0.000)	(0.000)	(0.000)
ID	-0.280***	-0.216***	-0.126*	-4.48E-0***
	(0.000)	(0.000)	(0.000)	(0.001)
HDI	0.077*	8.097***		7.483***
	(0.072)	(0.000)		(0.000)
IR			0.307***	0.342***
			(0.000)	(0.000)
IR*ID			-6.68E-**	-0.0661
			(0.023)	(0,320)
GE		564.1***		516.7***
		(0.000)		(0.000)
GE*HDI		-564.137***		-516.7***
		(0.000)		(0.000)

Variable	Model			
	[1]	[2]	[3]	[4]
Dependent Variable: Unemployment Rate				
EG	-0.219***	-0.3008***	-0.289***	-0.355***
	(0.000)	(0.000)	(0.000)	(0.000)
Obs	139	139	138	138
R^2	0.1742	0.2788	0.2585	0.402
Fixed-Effect	No	No	No	No
Classical Assumption	Yes	Yes	Yes	Yes

Note: * Significance at 10%, **Significance at 5%, *** Significance at 1%

The results show the estimation of the panel data regression with unemployment as the dependent variable. Domestic investment consistently has a significant negative impact on unemployment. The impact of the Human Development Index (HDI) based on Models 1, 2, and 3 consistently shows a significant positive effect on unemployment. According to Models 3 and 4, the interest rate has a significant positive impact on unemployment. Model 3 explains that the interest rate can negatively moderate the relationship between domestic investment and unemployment, meaning that each increase in interest rates will weaken the impact of investment on reducing unemployment. Models 2 and 4 indicate that government spending has a significant positive effect on unemployment while negatively moderating the relationship between HDI and unemployment. This means that each increase in government spending will weaken the impact of HDI on increasing poverty.

Robustness Test

The robustness test of the model in this study was conducted by estimating different models that involve control variables and by including or reducing moderating and interaction variables. Based on the results displayed in the table, it is evident that all four estimation models consistently show the effects of the coefficients, both for the dependent variables of income inequality, poverty, and unemployment.

Discussion

The Relationship Between Domestic Investment and Inequality, Poverty, and Unemployment

Based on the research findings, the author discovers that domestic investment has a negative and significant impact on income inequality, evidenced by a coefficient value of -7.41. This indicates that increasing domestic investment in Sumatra can reduce income inequality. Therefore, this research validates the empirical studies by Ameer et al. (2021) and Lee et al. (2022), showing that investment can be key to reducing income inequality through appropriate strategies. The importance of public policy in ensuring that investment not only drives economic development but also supports broader social goals is crucial. Thus, this research also demonstrates Romer's, (1990)endogenous growth theory, which emphasizes the significance of proper investment in human capital to promote more inclusive growth.

Specifically, economic policies, especially in Sumatra, urgently require the role of institutions and policies that support domestic investment. Such factors can be the primary determinants of investment flows. A solid institutional structure can act as a catalyst in directing investments to sectors that provide broad benefits for society. Effective institutions can also identify sectors most in need of investment and ensure that capital is allocated appropriately (Erten et al., 2021). Consequently, North (1990)Institutional Economics theory emphasizes that investment requires regulations that guarantee it does not concentrate in certain sectors and become monopolized by a few individuals. Oversight of exploitative business practices must be addressed to ensure that the impact of investment can reduce inequality (Davarzani, 2022).

The research findings indicate that the impact of domestic investment on poverty shows a coefficient value of -6.33. Essentially, this finding suggests that a 1% increase in domestic investment can reduce poverty. However, this research does not fully validate the Dynamic Theory (Harrod, 1939). Thus, the empirical study by Zuraida & Asmara (2024) provides crucial insights into addressing poverty. A political will is necessary to combat poverty through appropriate policies. Since the introduction of (Romer, 1990)In the context of endogenous growth theory, policymakers should assess the significance of increasing investments aimed at enhancing physical capital and human resources, which can ultimately help reduce poverty in the long term. It becomes problematic if investment is solely focused on sectors that do not affect impoverished communities, as the impact may be limited. Establishing a strong foundation in education and training is a viable solution for guiding investments to improve the quality of the domestic workforce, thereby supporting poverty reduction through enhanced productivity and income. This concept aligns with Becker's (1992) Human Capital theory, which emphasizes that with better skills and knowledge, workers can produce higher output and ultimately contribute to economic development and poverty reduction.

This study finds that domestic investment has a negative and significant impact on unemployment, confirmed by a coefficient value of -0.280. Therefore, increasing domestic investment in Sumatra can decrease unemployment. These findings validate empirical studies by Saha (2024), Abdulkarim (2023), and Alalawneh & Nessa (2020), indicating that when domestic or foreign capital is allocated for productive projects, it leads to an increased demand for labor, ultimately reducing unemployment. This fact may support the ideas of Schumpeter & Keynes (1936)that fiscal policies can increase aggregate demand, boost production, and ultimately require more labor. Thus, this research underscores the importance of policies that encourage domestic investment as a component for reducing unemployment. By strengthening domestic investment, it not only contributes to lowering unemployment rates but also fosters sustainable economic development.

The Relationship Between Human Capital and Inequality, Poverty, and Unemployment

The results of this research indicate that the Human Development Index (HDI) has a significant negative impact on income inequality. This result implies that every increase in HDI will reduce the level of income inequality. This finding aligns with the theories of Rostow and Musgrave, as HDI plays a crucial role in economic development through education and health; adequate education and health allow production factors to be maximized, thus impacting the economy (Aminda et al., 2024). Sarkodie & Adams (2020) also state that income inequality negatively affects human development, meaning that to reduce income disparity, an enhancement in the quality of human resources is necessary to maximize the existing production factors. Consistent with previous research, Leal (2016) also asserts that income inequality can affect the quality of life. Therefore, improving the quality of life is a solution for reducing income inequality.

In this study, the data processing results show that HDI significantly negatively affects poverty. The findings suggest that every improvement in human development can help reduce poverty. Logically examined, improvements in the quality of life can maximize production factors, leading to profits that can increase community income, thereby alleviating poverty. This, in turn, enables communities to access healthy food, modern technology, and quality education. The results align with previous studies, such as those by Ahmad et al. (2019), which found that HDI negatively and significantly impacts poverty. Their research indicates that education is the most dominant factor in addressing poverty. Meriyanti (2015) also states that programs aimed at improving HDI contribute to a 35.2% reduction in poverty. Pradana & Sumarsono (2018) also indicate that increasing HDI quality will positively impact economic growth rates that can address poverty. Cholili (2014) also found that HDI plays a significant role in reducing poverty. Reviewing earlier literature suggests that high-quality human resources have a tangible impact on raising individual living standards.

Based on this research, the findings do not align with the established hypothesis. The results indicate a positive relationship between HDI and unemployment, meaning that every increase in HDI may correlate with increased unemployment. Literature from Smith (1993) and Taner et al. (2011) critiques the Human Development Index for using few indicators to measure national development. They propose including unemployment as a new HDI indicator, as it could make the Human Development Index more comprehensive and provide a suitable approach to assess the development performance of nations. The findings also contradict Malthus's theory, which posits that improvements in quality of life should meet both physical and non-physical needs (Meriyanti, 2015). This research also does not align with (Soekapdjo & Oktavia, 2021), who state that HDI significantly and negatively affects unemployment. The discrepancies in these findings could be due to various factors, including a high number of job seekers not matching available job opportunities. Additionally, it may result from the unequal distribution of national wealth or other developmental aspects not accurately accounted for in the Human Development Index (HDI) calculation (Taner et al., 2011).

The Role of the Monetary-Fiscal Policy Mix

Our findings indicate that monetary policy, as represented by interest rates, has a positive relationship with income inequality. In other words, every increase in interest rates will exacerbate inequality. This finding indirectly suggests that rising interest rates due to contractionary monetary policy tend to increase inequality. This aligns with Keynes's intersection theory in the IS-LM model, where interest rates are the cost of holding money that determines investment levels. Our findings also agree with the results of Nguyen (2023), which indicate that expansive monetary policy minimizes inequality. We further reinforce this finding with the negative significant coefficient of the interaction variable between interest rates and domestic investment on income inequality, meaning that higher interest rates weaken the influence of domestic investment in reducing inequality; as interest rates rise, investment declines.

On the other hand, we found no evidence that interest rates directly impact poverty, nor that they can moderate the relationship between domestic savings and poverty, likely due to the insignificant effect of domestic savings on poverty. The absence of this relationship reinforces the findings of Nasution et al. (2022) regarding the long-term effects of interest rate on poverty. We also introduced the unemployment variable and found that unemployment has a positive relationship with poverty, indicating that every increase in unemployment reduces households' ability to meet their living needs. Higher interest rates increase unemployment, showing a similar relationship to its effect on income inequality, this condition then reinforces the findings of Bosna (2022). The labor sector requires significant investment to achieve expansion and absorb as many workers as possible. However, contractionary monetary policies that drive up interest rates can hinder this goal. Investment becomes expensive, and its contribution diminishes, ultimately leading to reduced productivity. This argument is also supported by the significant negative interaction between interest rates and domestic investment on unemployment, indicating that higher interest rates weaken the impact of domestic investment on reducing unemployment.

Fiscal policy, represented by government spending, has a negative relationship with poverty and unemployment, although similar findings have not been found regarding its impact on income inequality. In other words, this finding aligns with the primary function of fiscal policy as stated by Okri Handoko et al. (2023), which is to allocate budgets and maintain macroeconomic stability, yet its function of distributing income remains unproven. Effective government spending in addressing poverty and unemployment seems to indicate the occurrence of a multiplier effect in Sumatra's economy as stated by(Mankiw, 2007); government expenditure, manifested through public and social spending, increases community purchasing power, subsequently driving productivity. This ultimately helps lift communities out of poverty and creates broader job opportunities.

Our argument is also supported by the interaction between government spending and HDI in influencing income inequality, poverty, and unemployment. Government spending can moderate the relationship between HDI and these three economic development indicators in Sumatra. Government spending includes investments in education and health, which also contribute to Gross Regional Product (GRP) affecting national income. This means that sound planning in government expenditure is crucial for achieving HDI or the quality of human capital in the ten provinces of Sumatra. Increasing HDI will further reduce inequality and poverty while enabling citizens to obtain decent jobs for their livelihoods.

Conclusion

To estimate the impact of domestic investment and human capital, as well as the contingent effects of fiscal and monetary policy mix, this study employs panel data regression and moderation regression analysis. The findings reveal that domestic investment policies are effective in reducing income inequality and unemployment; however, their effectiveness in alleviating poverty has not yet been confirmed. Human capital appears to effectively reduce income inequality and poverty levels; nevertheless, it unexpectedly contributes to an increase in unemployment. This suggests that, in addition to improving human well-being, there is a pressing need to expand employment opportunities.

Moreover, economic stabilization policies—characterized by the coordination of fiscal and monetary instruments—play a vital role in maintaining economic resilience and addressing the three key development challenges. These findings underscore the importance of well-designed fiscal and monetary policy, as the evidence indicates that expansionary approaches are indeed effective in mitigating these challenges.

Efforts to accelerate capital accumulation must be strengthened, particularly in provinces with low investment inflows. Collaboration between local governments and the private sector is essential to enhance the attractiveness of these regions to potential investors. Additionally, the government must continuously revitalize budget allocations for human capital development in order to foster a more capable and competitive workforce—one that can effectively utilize resources, engage actively in the development process, and equitably share in its benefits.

Declaration

Authors' Contributions

We acknowledge several individuals who have made significant contributions from the initial design stage to the final completion. Muhammad Akbar Ramadhani was responsible for the conceptualization, including theme selection, variable classification, statistical testing, and analysis of findings. Basri contributed to refining the conceptual framework and analyzing the findings. Fahrul Hudatil Atkiyan was responsible for data documentation and also took part in the analysis of findings.

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Informed Consent Statement

Informed consent was not applicable to this study.

Availability of Data and Materials

All data used in this study are publicly available from the Statistics Indonesia (Badan Pusat Statistik) offices of each Sumatra province and from Bank Indonesia (for interest rate data), using the indicator names provided in the operational variable definition table. This study did not involve the generation or analysis of new data.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

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The authors do not have any further acknowledgements to declare.

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