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The Impact of Fiscal Decentralization on Human Development Outcomes and Income Equality at the Provincial Level in Indonesia

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ABSTRACT

Fiscal decentralization since the reform era has transformed regional development policies in Indonesia. However, its effectiveness in enhancing human development and reducing income inequality varies across regions and across the empirical literature. This study analyzes the impact of fiscal decentralization reflected through the degree of fiscal decentralization, education expenditure, and health expenditure on the Human Development Index and Gini coefficient, with poverty rate, GDP per capita, and open unemployment rate as control variables. Panel data from 34 Indonesian provinces for the period 2017-2023 were used. This study employed two types of analysis: qualitative and quantitative. Qualitative analysis was used to describe the state of fiscal decentralization, the Human Development Index, and income inequality across Indonesia's 34 provinces from 2017 to 2023. A typological classification was then conducted to map regional conditions across four quadrants. Quantitative analysis was used to examine the impact of fiscal decentralization on the Human Development Index and income inequality at the provincial level in Indonesia. The analytical technique employed was panel data regression, combining cross-sectional and time-series data. The time-series data used covers the years 2017 to 2023, while the cross-sectional data consists of data from 34 provinces in Indonesia. Data processing was performed using Microsoft Office Excel 2021 and EViews 10. The findings indicate that fiscal decentralization has a significant positive effect on HDI (0.14) and a significant negative effect on inequality (-0.00). The research findings imply the need to enhance regional fiscal autonomy, prioritize education and health budget allocation, and optimize regional development.

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■ INTRODUCTION

Fiscal decentralization in Indonesia emerged as a direct response to the failure of the centralized system inherited from the New Order, particularly in managing natural resources whose endowments differ markedly across regions (Nasution, 2017). Under that regime, revenues from oil, gas, mining, and forestry were largely appropriated by the central government. The New Order's equalization policies transferred wealth away from resource-rich provinces, channeling it both to Jakarta and to poorer regions, and the subsidizing provinces resented a strategy they saw as holding back their own development (Tadjoeddin et al., 2001).

The resulting horizontal inequalities bred deep grievances in resource-rich provinces such as Aceh, Riau, East Kalimantan, and Papua. These grievances were expressed through the re-emergence of separatist movements, the Free Aceh Movement (*Gerakan Aceh Merdeka*, GAM) and the Free Papua Organization (*Organisasi Papua Merdeka*, OPM), and strong pressure for separation or federalism in Riau and East Kalimantan, all reflecting dissatisfaction with the centralized system (Tadjoeddin et al., 2001). Aceh provides a concrete illustration: under the New Order, the central government channeled the bulk of revenues generated from the province's natural resources to Jakarta, leaving the producing region with little direct benefit and fueling deep economic grievances (Tadjoeddin et al., 2001). Amplified by the 1997–1998 financial crisis and the subsequent Reformasi, these conditions produced strong public pressure for regions to manage their own

resources (Li et al., 2026).

In an effort to achieve these goals, fiscal decentralization grants local governments the authority to ensure the delivery of basic services to the entire population (Canavire-Bacarreza et al., 2026; Murshed et al., 2026). This authority is granted with the hope of realizing national welfare (Nurhemi & Suryani, 2015). Fiscal decentralization and regional autonomy in Indonesia began with the reform period in 2000 through the enactment of Law No. 25 of 1999 on Financial Balance between the Central and Regional Governments. This regulation was subsequently amended by Law No. 33 of 2004. Eighteen years later, this law was revised by Law No. 2 of 2022 on Central-Local Government Relations and Finance (HKPD Law). The HKPD Law strengthens fiscal decentralization to achieve equitable public services and community welfare. Through fiscal decentralization, local governments possess fiscal authority and responsibility. These responsibilities include financial management and budget allocation (Christian & Ispriyarso, 2019; Yahaya, 2026).

In practice, fiscal decentralization has significantly transformed decision-making regarding the fulfillment of regional needs by expanding the authority of local governments (Siburian, 2022). The devolution of authority from the central government enables regions to take responsibility for their own public services and government financing as a consequence of their autonomous status (Christian & Ispriyarso, 2019). The performance of fiscal decentralization can be interpreted as a measure of a region's capacity for self-reliance. The higher the region's self-reliance, the greater the fiscal space available to develop its territory in line with the region's comparative advantages (Nasution, 2019). A region's capacity for self-reliance can be measured through the degree of fiscal decentralization (DDF). A higher DDF indicates a greater capacity for the region to fund its expenditure needs through self-generated revenue (Pasholihah & Anwar, 2023).

From 2017 to 2023, based on regional budget (APBD) implementation data from the Directorate General of Fiscal Balance (DJPK, 2025), total regional revenue is estimated to average 1,160.85 trillion rupiah, while average own-source revenue (PAD) during the same period is 298.85 trillion rupiah. It can also be seen that the average value of PAD is 25.74 percent of total regional revenue. Based on the average value (2017–2023), the region with the largest total revenue, 62.13 trillion rupiah, is DKI Jakarta, with PAD reaching 42.93 trillion rupiah, or 69.1 percent of its total revenue. This indicates a very high level of fiscal autonomy. In second place, West Java has a total revenue of 34.47 trillion rupiah, with PAD of 20.18 trillion rupiah, accounting for 58.5 percent of its total revenue. Meanwhile, the province with the lowest total revenue, 1.87 trillion rupiah, is Gorontalo, with PAD of only 0.43 trillion rupiah, or 23.0 percent of its total regional revenue. A similar situation is observed in North Maluku, which has a total revenue of 2.47 trillion rupiah, with PAD of 0.44 trillion rupiah, or 17.8 percent of its total revenue. In terms of regional expenditure, DKI Jakarta has the highest at 59.03 trillion rupiah, followed by West Java at 35.02 trillion rupiah. Meanwhile, the lowest expenditure is in Gorontalo at 1.85 trillion rupiah.

This study is grounded in the theory of fiscal federalism, which provides the conceptual foundation for understanding why and how the assignment of fiscal authority across levels of government affects welfare and distributional outcomes. In its first-generation formulation, the theory rests on the Decentralization Theorem of Oates (1972), which holds that the provision of public goods is more efficient when delivered by the level of government closest to the population, because local authorities possess superior information about local preferences and needs (Oates, 1972; Tiebout, 1956). Within Musgrave's (1959) classic division of public-sector activity into the allocation, distribution, and stabilization functions, the theory assigns the allocation function to sub-national governments, while the distribution (redistributive) and stabilization functions are conventionally retained by the central government because the mobility of capital and labor erodes the capacity of local governments to redistribute income. This functional assignment is precisely what makes fiscal federalism a suitable lens for analyzing the joint effects of decentralization on human development and income inequality: gains in human development are expected to flow from the allocative efficiency of locally provided services such as health and education, whereas the effect on income inequality is theoretically ambiguous because redistribution is not the natural task of sub-national governments.

The second-generation theory of fiscal federalism refines this view by emphasizing the political-economy incentives that govern sub-national behavior, arguing that the welfare effects of decentralization depend on the alignment of fiscal authority with accountability and on the design of intergovernmental transfers (Weingast, 2009; Oates, 2005). Where local revenue autonomy is weak and regions remain dependent on central

transfers, the accountability mechanism that is supposed to translate decentralization into better services and more equitable outcomes is blunted because local officials are not fully responsible at the margin for the funds they spend. This refinement is directly relevant to the Indonesian setting, in which the bulk of regional revenue continues to come from central transfers and own-source revenue (PAD) capacity varies widely across provinces, so that the formal degree of decentralization may not translate into the welfare gains predicted by first-generation theory.

Applied to Indonesia, fiscal federalism theory explains the observed phenomena through two opposing channels. On the allocation side, the devolution of expenditure authority, as captured by the Degree of Fiscal Decentralization (DDF), should enable provinces to tailor health, education, and infrastructure spending to local conditions, thereby raising the Human Development Index (HDI). On the distribution side, however, the theory predicts that decentralization may widen income inequality when sub-national fiscal capacity is uneven: the General Allocation Fund (DAU) performs an equalizing role consistent with the central distribution function, whereas the Revenue-Sharing Fund (DBH), tied to the geographically uneven distribution of natural resources, tends to reproduce the horizontal fiscal imbalances against which the theory warns. Fiscal federalism theory thus furnishes a coherent framework for examining how the form and degree of fiscal decentralization simultaneously shape human development and income inequality at the provincial level in Indonesia.

Data from the Directorate General of Fiscal Balance (DJPK, 2025) indicate that provincial expenditures generally exceed total revenues. Local Own-Source Revenues (PAD) are insufficient to fully cover local government spending needs, necessitating the receipt of transfer funds from the central government. This situation creates regional dependence on the central government, as evidenced by the fact that in 2023, 70.8 percent of regional revenue came from central government transfer funds. Given that the central government's transfer funds are tied to the minimum service standards (SPM), regions with low PAD have limited fiscal space. Local governments' dependence on the central government for funding limits their ability to develop development programs (Nasution, 2019). The implementation of fiscal decentralization is expected to accelerate the achievement of community welfare by improving services, empowering communities, and fostering community engagement (Malau, 2022; Ruhunlela et al., 2026).

The Human Development Index (HDI) and income inequality are indicators that reflect societal well-being (Harliyani & Haryadi, 2016; Nasution, 2019; Fitriana & Agustina, 2019; Malau, 2022). The HDI provides a snapshot of societal well-being through an index encompassing health, education, and income (UNDP 1995, BPS 2015). Meanwhile, according to the BPS, the Gini coefficient is an indicator of overall inequality. Based on 2023 provincial HDI and Gini ratio data, there are significant disparities in human development across Indonesia's regions. With a national HDI of 74.39, 18 provinces are above the national average, while 16 provinces remain below it. DKI Jakarta recorded the highest HDI at 83.50, which falls into the very high category, followed by DI Yogyakarta at 81.09, Riau Islands at 79.68, and East Kalimantan at 78.20. Meanwhile, West Papua recorded the lowest HDI at 67.47, followed by East Nusa Tenggara at 68.01 and West Sulawesi at 69.80. Income distribution, as measured by the Gini coefficient, shows that Gorontalo has the best income distribution with a Gini coefficient of 0.29, followed by Maluku and Bengkulu at 0.29 and 0.30, respectively. Conversely, West Java showed the highest inequality with a Gini coefficient of 0.43, followed by Riau Islands at 0.41 and Papua at 0.39. There are 21 provinces with income distribution better than the national average and 13 provinces that remain above the national average.

According to BPS (2024) data, provinces with high HDIs tend to have relatively high income inequality. DKI Jakarta, with the highest HDI, has a Gini coefficient of 0.43; the Riau Islands, with an HDI of 79.68, have a Gini coefficient of 0.41; and West Java, with an HDI of 74.60, has a Gini coefficient of 0.43. Conversely, several provinces with relatively low HDIs exhibit more equitable income distribution, including Maluku (HDI 72.75, Gini 0.29), Bengkulu (HDI 74.30, Gini 0.30), and Gorontalo (HDI 71.25, Gini 0.29). This data indicates that high levels of human development are not always accompanied by equitable income distribution, and vice versa. It is this disparity in development across regions that reinforces the urgency of implementing fiscal decentralization as an instrument for equitable development. Fiscal decentralization policy, as a manifestation of regional autonomy, grants local governments the authority to allocate resources through programs that prioritize the welfare of the poor (Siburian, 2022).

With this authority, local governments

can develop labor programs and policies aligned with their region's capacity to create new jobs. This is expected to reduce unemployment while simultaneously lowering poverty rates and inequality (Siburian, 2022). The success of human development, as reflected in the Human Development Index (HDI), depends on local governments' commitment to providing targeted support facilities that align with local community needs (Harliyani & Haryadi, 2016). Effective implementation of fiscal decentralization enables each region to optimize its potential and formulate development programs aligned with its characteristics. This, in turn, can promote equitable development and reduce economic disparities between regions.

Fiscal decentralization can improve the efficiency of public spending, reduce regional disparities, and drive economic growth (Zulkipli, 2017). The 2005–2025 Long-Term Development Plan (RPJP) identifies fiscal decentralization as a key pillar of national development, promoting regional autonomy and equitable development. The implementation of fiscal decentralization is expected to improve the provision of public services, such as regional infrastructure, health care, and education (Martinez-Vazquez, 2003). Through these measures, fiscal decentralization is expected to promote the realization of public welfare. Therefore, the performance of fiscal decentralization is crucial in efforts to implement development and achieve public welfare (Nurhemi & Suryani, 2015). The degree of fiscal decentralization (DDF) is one indicator for assessing the performance of fiscal decentralization through regional financial autonomy.

The implementation of fiscal decentralization in Indonesia during the 2017–2023 period reveals several phenomena that warrant further analysis. Empirical data show an increase in the Human Development Index (HDI) from 70.81 in 2017 to 74.39 in 2023, reflecting an improvement in aggregate human development outcomes. However, this development was accompanied by fluctuations, with a recorded decline in 2020 to 71.94, followed by a consistent increase through 2023. Although showing improvement, the 2023 HDI of 74.39 remains below the target set by the 2020–2024 National Medium-Term Development Plan (RPJMN), which aims for an HDI of 75.54 by 2024. Data for 2023 indicate that development disparities between regions remain significant, with DKI Jakarta recording the highest HDI at 83.50 points and West Papua the lowest at 67.47 points, a gap of 16.03 points. The Degree of Fiscal Decentralization (DDF), as an indicator of regional autonomy, showed high volatility throughout the 2017–2023 period. The DDF declined from 25.48 percent in 2017 to 23.72 percent in 2020, then increased again to 28.25 percent in 2023.

The relationship between fiscal decentralization and income inequality remains unsettled in the international literature. In theory, decentralization should reduce inequality because local governments understand regional needs better than the center. In practice, the effect depends on context. In high-income countries, decentralization tends to narrow the gap between top and middle incomes. However, it can widen the gap at the bottom through sub-central tax autonomy (Stossberg et al., 2016), and higher tax decentralization across 23 OECD countries is linked to greater household inequality (Sacchi & Salotti, 2014). The form of decentralization, revenue versus expenditure, therefore matters as much as its degree.

Development level sharpens this contrast. Cross-country studies show that decentralization helps equalize regional incomes in wealthier countries but can raise regional inequality in developing and emerging economies (Lessmann, 2012), largely because poorer countries have weaker institutions and larger pre-existing disparities (Rodríguez-Pose & Ezcurra, 2010). The scale of sub-national spending also matters: Sepulveda and Martinez-Vazquez (2011) find that decentralization reduces inequality only up to a threshold of about one-third of total government expenditure, and that decentralization of expenditure worsens inequality where government size is small.

Indonesia largely follows the developing-country pattern. A low and stagnant DDF, wide gaps in own-source revenue (from 69.1 percent in DKI Jakarta to below 20 percent in several provinces), and heavy dependence on transfers all point toward divergence. Although the DAU helps equalize fiscal revenue, the DBH is inequality-increasing because natural resources are unevenly distributed, leaving overall fiscal disparity high (Akita et al., 2021). Province-level evidence is more optimistic. Siburian (2020) finds that decentralization reduced regional income inequality between 2001 and 2014. However, the national picture, with a Gini coefficient that still misses the RPJMN target, suggests that equalizing instruments are offset by inequality-increasing ones and by big differences in PAD capacity. The redistributive promise of decentralization in Indonesia is thus muted by weak local fiscal capacity, rather than realized as the convergence seen in mature

OECD economies.

Various studies have examined the impact of fiscal decentralization on welfare indicators, but have yielded mixed results. Malau (2022) found that the degree of fiscal decentralization has a significant positive effect on the Human Development Index (HDI) in South Sumatra Province. Conversely, Nasution (2019), using a panel data analysis of 34 Indonesian provinces, concluded that fiscal autonomy has no significant effect on the HDI. In the context of inequality, Pietrovito et al. (2022) used an OLS regression model and demonstrated that revenue decentralization is significantly and negatively associated with income redistribution, whereas fiscal autonomy increases inequality, as observed in the Special Region of Yogyakarta. Furthermore, a study by Siburian (2022) confirms that fiscal decentralization can serve as an instrument to reduce inequality and improve welfare, provided that public spending is directed toward strategic sectors such as education and health. Theoretically, fiscal decentralization aims to improve the efficiency of resource allocation and public service delivery and to enhance welfare by aligning local preferences with the provision of public goods (Martinez-Vazquez, 2003; Siburian, 2022).

Given these varying empirical results, it is important to further examine how the form and degree of fiscal decentralization affect welfare and inequality, particularly in Indonesia's regional context. As outlined above, the implementation of fiscal decentralization in Indonesia has not been effective in achieving national development goals. Furthermore, differing findings have emerged across various literature reviews regarding the impact of fiscal decentralization on development. On the one hand, fiscal decentralization is expected to serve as an instrument to promote regional autonomy and equitable development. However, data indicate that regional fiscal autonomy remains low, and national development targets have not yet been achieved. Therefore, an in-depth analysis is needed regarding how fiscal decentralization influences the achievement of human development and income equity at the provincial level in Indonesia.

Against this backdrop, the novelty of this study lies in three respects. First, it integrates the analysis of human development and income inequality within a single fiscal-federalism framework, whereas most prior Indonesian studies examine each outcome in isolation. Second, rather than treating fiscal decentralization as a single aggregate, it decomposes the concept into the degree of fiscal decentralization, which captures regional fiscal autonomy, and functional expenditure on education and health, thereby separating empirically the channels through which decentralization shapes welfare and distribution. Third, it employs recent provincial panel data for the 2017–2023 period that capture the institutional setting following the enactment of the Central-Local Government Relations and Finance Law (HKPD Law), a context not yet covered by the existing literature. The study therefore addresses the research gap arising from the inconclusive and largely outcome-specific findings of previous work, while simultaneously responding to the theoretical expectation that both the degree and the functional composition of fiscal decentralization condition welfare and distributional outcomes.

Based on the phenomena, theoretical framework, and research gap described above, this study seeks to answer the following research questions:

1. How do fiscal decentralization, human development, and income inequality develop across the 34 provinces of Indonesia, and how are the provinces classified when mapped typologically into four quadrants based on the relationship between the degree of fiscal decentralization and, respectively, the Human Development Index and the Gini coefficient?
2. How does fiscal decentralization, as reflected in the degree of fiscal decentralization, education expenditure, and health expenditure, affect the Human Development Index at the provincial level in Indonesia?
3. How does fiscal decentralization, as reflected in the degree of fiscal decentralization, education expenditure, and health expenditure, affect income inequality, as measured by the Gini coefficient, at the provincial level in Indonesia?

■ METHOD

Types and Sources of Data

This study uses secondary data. The data used consist of annual data from 34 Indonesian provinces, covering the period from 2017 to 2023. The data obtained was then tabulated and transformed into panel data. There are two dependent variables in this study: the Human Development Index and the Gini Coefficient. Meanwhile, the independent variables that are the primary focus of this study are fiscal decentralization, as reflected by the degree of fiscal decentralization and functional expenditure. Additionally, other relevant

Table 1. Data, units, sources, and variable names

Data	Units	Sources	Year	Variable
Human Development Index	Index	BPS	2017-2023	HDI
Gini Coefficient	Index	BPS	2017-2023	GINI
Degree of Fiscal Decentralization	Percent	DJPK	2017-2023	DDF
Education Expenditures	Natural Log of Rupiah	DJPK	2017-2023	LNEDU
Health Expenditures	Natural Log of Rupiah	DJPK	2017-2023	LNHEALTH
Percentage of the Poor Population	Percent	BPS	2017-2023	PO
Open Unemployment Rate	Percent	BPS	2017-2023	OUR
GRDP Per Capita	Natural Log of Rupiah	BPS	2017-2023	LNCPT

independent variables are also utilized in this study. Table 1 provides a detailed overview of all variables in this study.

Data Analysis

This study employed two types of analysis, qualitative and quantitative, each of which is described below.

Qualitative analysis

Qualitative analysis was used descriptively to portray the state of fiscal decentralization, the Human Development Index, and income inequality across Indonesia's 34 provinces from 2017 to 2023. A typological (quadrant) classification was then conducted to map regional conditions across four quadrants based on the combination of the degree of fiscal decentralization and each outcome indicator.

Quantitative analysis

Quantitative analysis was used to examine the impact of fiscal decentralization on the Human Development Index and income inequality at the provincial level in Indonesia. The analytical technique employed was panel data regression, combining cross-sectional data (34 provinces) and time-series data covering 2017 to 2023. Data processing was performed using Microsoft Office Excel 2021 and EViews 10. The stages of the quantitative analysis, panel data regression, model selection, statistical criteria testing, classical assumption testing, and model formulation are described in the following sub-sections.

Panel data regression

Panel data analysis is an econometric method that combines time-series data and cross-sectional data. As explained by Baltagi (2008), panel techniques have several advantages over cross-sectional analysis, including providing more comprehensive information, reducing multicollinearity among variables, increasing the degrees of freedom, and offering superior estimation efficiency. Panel techniques can also reduce measurement bias when using large observational samples. Gujarati (2009) identified three variants of panel regression models: Pooled Least Squares (PLS), Fixed Effects Model (FEM), and Random Effects Model (REM).

Beyond these econometric advantages, the choice of a panel model is also grounded in fiscal federalism theory. The decentralization theorem (Oates, 1972) and the preference-matching argument (Tiebout, 1956) rest on the premise that provinces are heterogeneous in preferences, fiscal capacity, and institutional characteristics, and that the welfare gains from decentralization arise from how each region responds to its own conditions over time. Testing these assumptions therefore requires an estimator that can separate stable, unobserved province-specific characteristics, such as geography, natural resource endowments, and institutional quality, from within-province variation in fiscal decentralization. Cross-sectional or pure time-series regressions cannot make this separation. In contrast, the Fixed Effects panel estimator controls for time-invariant regional heterogeneity, so that the

estimated coefficients capture the within-province effect of changes in fiscal decentralization on the HDI and inequality, which is precisely the causal channel posited by fiscal federalism. In addition, second-generation fiscal federalism (Oates, 2005; Weingast, 2009) emphasizes that local fiscal incentives evolve, a dynamic that can only be observed by combining the cross-sectional and time dimensions of the data.

After carrying out the estimation using these three models, the best model was selected using three types of tests: (1) The Chow test (F-test), used to choose between PLS and FEM; (2) the Hausman test, used to choose between the Fixed Effects Model (FEM) and the Random Effects Model (REM); and (3) the LM (Breusch-Pagan) test, used to select the best model from the Random Effects Model (REM) and the Pooled Least Squares (PLS) model.

Statistical criteria test

Statistical criterion testing is a method for evaluating a model's validity. This method refers to statistical measures based on various approaches, such as: (1) F-statistic test: this test is carried out to analyse the combined effect of all independent variables on the dependent variable in the equation model, (2) T- statistic test, the purpose of this test is to assess the magnitude of the effect exerted by each independent variable on the dependent variable in the equation, and (3) Coefficient of Determination (R^2), the coefficient of determination is used to measure the extent to which an independent variable explains the observed variability in the dependent variable.

Test of classical assumptions

Tests of the classical assumptions must be carried out to ensure that the model used meets the requirements of the Best Linear Unbiased Estimator (BLUE). There are three tests of the classical assumptions: (1) A normality test is used to estimate the error term of a dataset. Normality can be assessed using the Jarque–Bera statistic generated by the model, (2) Test for heteroscedasticity occurs when the variances of the independent variable and the residuals across observations are not homogeneous (Gujarati, 2009), and (3) Autocorrelation test describes the correlation between data points within a single variable, or the correlation between a previous period and the error in the current period.

Model Formulation

In this study, two models were used to analyze the impact of fiscal decentralization on development. The purpose of estimating these two models is to examine how fiscal decentralization and other factors influence Indonesia's Human Development Index, unemployment, and poverty. The model formulation used in this study draws on previous research, including Malau (2022) and Fitriana & Agustina (2019).

1. HDI Model: The Impact of Fiscal Decentralization and Other Factors Affecting the HDI

$$IPM_{it} = \alpha_0 + \beta_1 DDF_{it} + \beta_2 LNDIDIK_{it} + \beta_2 LNSEHAT_{it} + \beta_5 TPT_{it} + \beta_6 LNKPT_{it} + \beta_7 PO_{it} + \varepsilon_{it}$$

2. The GINI Model: The Impact of Fiscal Decentralization and Other Factors Affecting Income Inequality

$$GINI_{it} = \beta_0 + \alpha_1 DDF_{it} + \alpha_2 LNDIDIK_{it} + \alpha_3 LNSEHAT_{it} + \alpha_4 TPT_{it} + \alpha_5 LNKPT_{it} + \alpha_6 PO_{it} + \varepsilon_{it}$$

Notes:
HDI= Human Development Index
OUR = Open Unemployment Rate
DDF = Degree of Fiscal Decentralization
LNEDU = Education Expenditures
LNHEALTH= Health Expenditures
GINI = Gini Coefficient
LNCPT = Per Capita Regional GDP
PO = Percentage of the Poor Population
α= Intercept
β= Estimation Parameters
i= 34 provinces
t= from 2017 to 2023
LN= Natural logarithm
ε= Error term

Legend for the numbers in the quadrant chart: (1) Aceh, (2) North Sumatra, (3) West Sumatra, (4) Riau, (5) Jambi, (6) South Sumatra, (7) Bengkulu, (8) Lampung, (9) Bangka Belitung Islands, (10) Riau Islands, (11) Jakarta, (12) West Java, (13) Central Java, (14) Yogyakarta, (15) East Java, (16) Banten, (17) Bali, (18) West Nusa Tenggara, (19) East Nusa Tenggara, (20) West Kalimantan, (21) Central Kalimantan, (22) South Kalimantan, (23) North Kalimantan, (24) East Kalimantan, (25) North Sulawesi, (26) Central Sulawesi, (27) South Sulawesi, (28) Southeast Sulawesi, (29) Gorontalo, (30) West Sulawesi, (31) Maluku, (32) North Maluku, (33) West Papua, and (34) Papua.

■ RESULTS AND DISCUSSION

The Relationship Between the Degree of Fiscal Decentralization (DDF) and the Human Development Index (HDI) in Indonesia

The results of the analysis of the relationship between DDF and HDI in Indonesia in 2017 using a quadrant approach

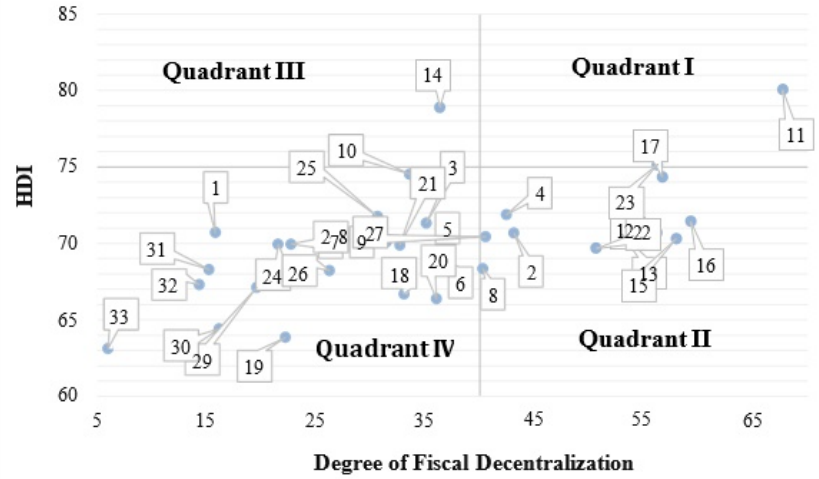

Figure 1. Relationship between the Degree of Fiscal Decentralization (DDF) and the Human Development Index (HDI) in 2017

are shown in Figure 1. In this quadrant analysis, provinces are classified into four quadrants based on their DDF and HDI values. The DDF value, which represents a region's fiscal autonomy, is plotted on the x-axis (horizontal line). Furthermore, the HDI value, which represents regional development performance, is plotted on the y-axis (vertical line). Quadrant I represents provinces with strong fiscal autonomy and above-average HDI performance. The HDI is considered good when its value is above 75, and DDF performance is considered good when its value is above 40 percent. Quadrant II represents provincial fiscal autonomy with a "good" rating and an "inadequate" HDI. Quadrant III represents provincial fiscal autonomy with a "low" rating and a "good" HDI. Meanwhile, Quadrant IV represents provincial fiscal autonomy with a "low" rating and an "inadequate" human development performance.

Based on the 2017 quadrant analysis of the relationship between FDD and HDI, two provinces fall into Quadrant I. This indicates that in 2017, 5.9 percent of Indonesian provinces had strong fiscal autonomy, with HDI performance categorized as good. Furthermore, 9 provinces were in Quadrant II, meaning that 26.5 percent of provinces in Indonesia had good fiscal autonomy but with HDI performance categorized as poor.

Meanwhile, there is 1 province in Quadrant III, indicating that 2.9 percent of Indonesia's provinces have low fiscal autonomy but with HDI performance in the "good" category. Significant development challenges are evident in the 21 provinces in Quadrant IV, which together comprise 61.8 percent, and still have low regional fiscal autonomy and an HDI performance categorized as poor.

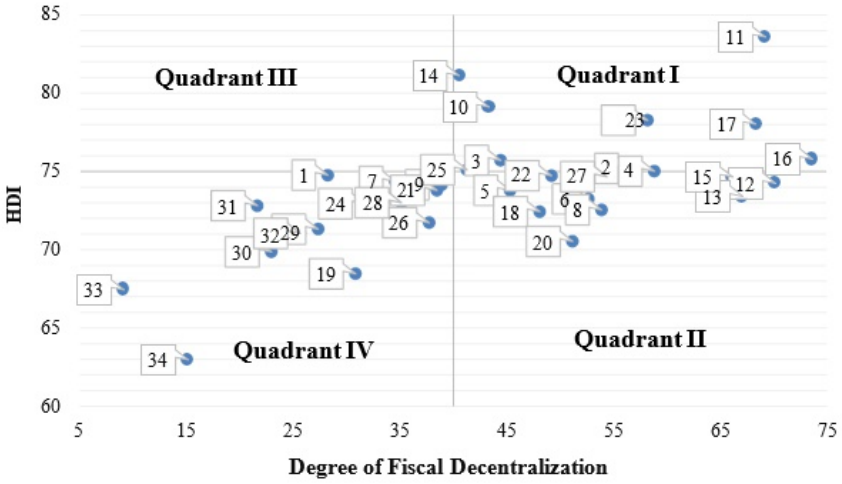

Figure 2. Relationship between the Degree of Fiscal Decentralization (DDF) and the Human Development Index (HDI) in 2023

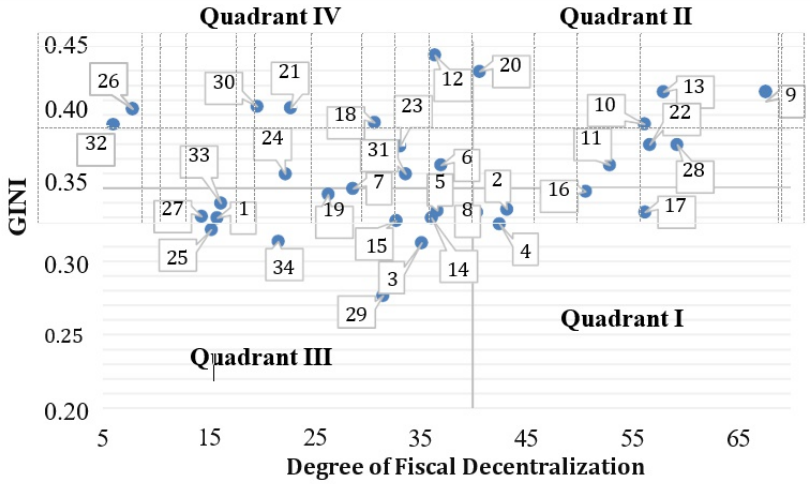

Figure 3. Relationship between the Degree of Fiscal Decentralization (DDF) and the Gini Coefficient in 2017

This indicates that in 2017, only 32.4 percent of Indonesian provinces had achieved a good level of fiscal autonomy (Quadrants I and II), while the majority still faced major challenges in achieving optimal fiscal autonomy.

As shown, the number of provinces in Quadrant I increased from 2 to 9 in 2023. Quadrant II increased from 9 provinces to 11 provinces. Quadrant III decreased from 1 province to 0 (none), as DI Yogyakarta moved up to Quadrant I. Meanwhile, Quadrant IV saw a significant decrease from 21 provinces to 14 provinces. This transformation indicates that in 2023, 58.8 percent of provinces have achieved a good level of fiscal autonomy (Quadrants I and II), a sharp increase from 32.4 percent in 2017.

Riau Islands recorded a shift from Quadrant IV to Quadrant I, indicating a successful development transformation that significantly improved both fiscal autonomy and human development. North Sumatra and West Sumatra also improved, moving from Quadrant IV to Quadrant I. Yogyakarta Special Region moved up from Quadrant III to Quadrant I, demonstrating a significant increase in fiscal autonomy while maintaining a good-category HDI performance. Banten, Bali, East Kalimantan, and North Sulawesi also recorded positive transformations, moving up from Quadrant IV to Quadrant I.

The Relationship Between the Degree of Fiscal Decentralization (DDF) and Income Inequality (Gini Coefficient)

The results of the analysis of the relationship between DDF and income inequality (Gini coefficient) in Indonesia in 2017 using a quadrant approach are shown in Figure 3. In this quadrant analysis, provinces are classified into four quadrants based on their

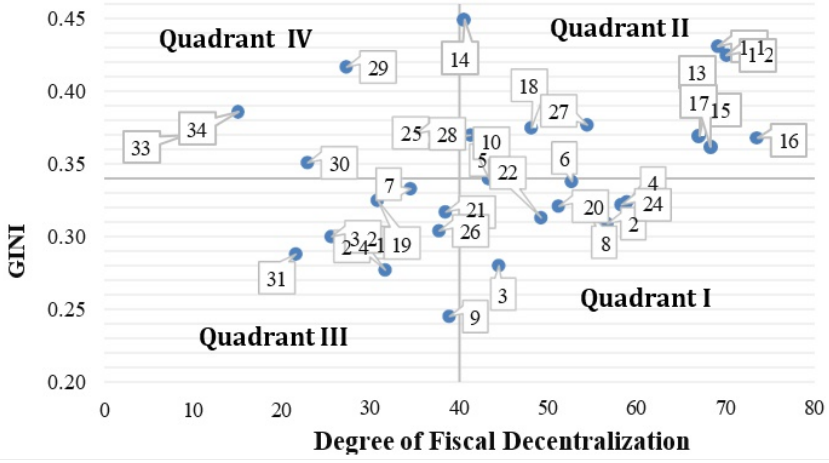

Figure 4. Relationship between the Degree of Fiscal Decentralization (DDF and the Gini Coefficient in 2023)

DDF and Gini coefficient values. The DDF value, which represents a region's fiscal autonomy, is plotted on the x-axis (horizontal line). The Gini Ratio, which represents regional income inequality, is plotted on the y-axis (vertical line).

Quadrant I represents provinces with good fiscal autonomy and low income inequality. In Indonesia, a province's Gini coefficient is categorized as low if it is below 0.35, and DDF performance is considered good if the value is above 40 percent. Quadrant II represents provincial fiscal autonomy categorized as good with a high Gini coefficient. Quadrant III represents provincial fiscal autonomy categorized as low, with a low Gini coefficient. Meanwhile, Quadrant IV represents provincial fiscal autonomy categorized as low with a high Gini coefficient.

Based on the 2017 quadrant analysis of the relationship between DDF and the Gini Coefficient, 5 provinces fall into Quadrant I. This indicates that in 2017, 14.7 percent of Indonesian provinces had strong fiscal autonomy and low levels of income inequality. Additionally, 9 provinces fall into Quadrant II, meaning that 26.5 percent of Indonesia's provinces possess strong fiscal autonomy but exhibit high levels of income inequality. Meanwhile, there were 12 provinces in Quadrant III, indicating that 35.3 percent of Indonesia's provinces had low fiscal autonomy and low income inequality. Significant development challenges are evident in the provinces in Quadrant IV, namely 8 provinces, or 23.5 percent of all provinces, which still have low regional fiscal autonomy coupled with high levels of income inequality.

In 2023, Quadrant I saw a very significant increase, rising from 5 provinces to 11 provinces. Quadrant II increased from 9 provinces to 11 provinces. This indicates positive progress in provinces with strong fiscal autonomy, although some still face challenges, including high levels of income inequality. Quadrant III decreased from 12 provinces to 8 provinces, while Quadrant IV saw a significant decline from 8 provinces to just 4 provinces. This remarkable development transformation is evidenced by the fact that in 2023, 64.7 percent of provinces have achieved a good level of fiscal autonomy (Quadrants I and II), a sharp increase from 41.2 percent in 2017. The five provinces that successfully moved from Quadrant III to Quadrant I are: (3) West Sumatra, (10) Riau Islands, (20) West Kalimantan, (21) Central Kalimantan, and (22) South Kalimantan. This indicates a significant improvement in fiscal autonomy while successfully maintaining income inequality within the low category.

South Sumatra also showed significant improvement by moving from Quadrant II to Quadrant I, indicating that it successfully reduced income inequality to the low category while maintaining strong fiscal autonomy. Meanwhile, Bangka Belitung and Central Sulawesi moved up from Quadrant IV to Quadrant III, indicating improved control of income inequality and a move into the low category. However, fiscal autonomy still needs improvement.

Selection of the Best Model

The process of selecting the best model was conducted in two stages: the Chow test and the Hausman test, with the results shown in Table 2. The estimator models compared include Pooled Least Squares (PLS), Fixed Effects Model (FEM), and Random Effects Model (REM). This study uses three indicators of fiscal decentralization: the degree of fiscal decentralization, education spending, and health spending as independent variables. The Human Development Index (HDI) and the Gini coefficient are used as dependent variables, and the poverty rate as a control variable.

Table 2 presents the results of the Chow and Hausman tests for the Human Development Index (HDI) and GINI models. Based on the Chow test results, both models yielded a chi-square probability value of 0.00, which is statistically significant; thus, the Fixed Effects Model (FEM) outperforms the Pooled Least Squares (PLS) model. Furthermore, the results of the Hausman test show a p-value of 0.037 for the HDI model, which is significant at the 95% confidence level, indicating that the FEM is the best estimator. Meanwhile, the GINI model yielded a Hausman test p-value of 0.00, which is significant at the 5% level; thus, the FEM was selected as the most appropriate estimator for both models.

Table 2. Results of the Chow test and the Hausman test

Type of Test	HDI Model	GINI Model
Chow test (Prob. Chi-Square)	0.00	0.00
Hausman test (Prob. Chi-Square)	0.0372	0.00
Jarque–Bera normality (statistic; Prob.)	2.99; 0.22	5.29; 0.07
Sum squared resid – unweighted	145.38	0.02
Sum squared resid – weighted	137.11	0.02
Durbin–Watson statistic	1.40	1.64

Results of the Classical Assumption Tests

Normality test

A normality test was conducted to evaluate whether the residuals in the regression model are normally distributed, and the results are shown in Table 2. Based on the results of the Jarque-Bera test, the IPM model had a p-value of 0.22 and a Jarque-Bera statistic of 2.99. In contrast, the GINI model yielded a p-value of 0.07 and a Jarque-Bera statistic of 5.29. Both models showed probability values greater than the significance level of 0.05, indicating that the residual data are normally distributed. This indicates that the normality assumption has been met in both models.

Heteroscedasticity test

Both models exhibit heteroscedasticity, as indicated by the Sum of Squared Residuals being smaller for the Weighted Statistics than for the Unweighted Statistics (Table 2). To address this issue, Generalized Least Squares (GLS) weighting was applied to both models. In panel data regression, GLS weighting works by transforming the model so that each observation is scaled by the inverse of the estimated error variance, thereby giving less weight to observations with higher variance. This transformation produces efficient and unbiased estimates even in the presence of heteroscedasticity (Gujarati, 2009). Specifically, the weighting procedure in this study followed the cross-sectional weights method, in which each cross-sectional unit is assigned a weight based on the residual variance specific to that unit, as implemented in EViews. As a result, the GLS-weighted estimates reported in Table 2 are considered valid and reliable for inference.

Autocorrelation test

The autocorrelation test uses the Durbin-Watson test to detect correlation among the model's residuals. With a lower limit (dL) of 1.71 and an upper limit (dU) of 1.83, the test results indicate that the two models differ in their characteristics. The IPM model obtained a Durbin-Watson value of 1.401788, which falls within the DW < dL range, indicating positive autocorrelation. Furthermore, the GINI model showed a Durbin-Watson value of 1.64, which falls within the DW < dL range, indicating positive autocorrelation. Although there are indications of positive autocorrelation in both models, applying GLS weighting has helped address potential autocorrelation issues.

Panel Regression Estimation Results

The HDI panel regression model shows an R-squared of 0.9678, indicating that 96.78 percent of the variation in the model can be explained by the fiscal policy variables used. The model's significance level (Prob. F-statistic = 0) reflects that the model is statistically valid. The panel regression model for the Gini coefficient shows an R-squared of 0.9604, indicating that 96.04 percent of the variation in the model can be explained by the fiscal policy variables analyzed. The model's significance level (Prob. F-statistic = 0) indicates the model's overall statistical validity.

The Effect of Fiscal Decentralization on the Human Development Index

Regression estimation results indicate that the degree of fiscal decentralization has a significant positive effect on the HDI with a coefficient of 0.14 ($p<0.01$). This finding suggests that a 1 percent increase in the degree of fiscal decentralization raises the HDI by 0.14 points. These results align with the research by Fitriana and Agustina (2019), who found a significant positive relationship between fiscal decentralization and the HDI in Papua; Malau (2022) in South Sumatra; and Sinuraya REM (2020), using data from 34 provinces, which

Table 3. FEM regression estimation results

Independent Variable	*IPM*		*GINI*	
	Coefficient	***Prob.***	***Coefficient***	***Prob.***
C	0.85	0.91	0.94	0.00
DDF	0.14	0.00	-0.00**	0.00
LNEDU	0.34**	0.19	-0.024411	0.15
LNHEALTH	2.54**	0.00	-0.01**	0.01
LNCPT	6.86**	0.00	- 0.04	0.32
OUR	0.09	0.19	0.00	0.85
PO	-0.05*	0.03	-0.009**	0.00
R-squared ®		0.96		0.96
Prob. (F-statistic)		0		0

(*)Significance level 5%; (**)Significance level 1%

revealed a significant positive impact of fiscal decentralization on the HDI. Pramartha & Dwiwandra (2018) and Harliyani & Haryadi (2016) also support similar findings. These results differ from the findings of Nasution (2019), who argued that fiscal autonomy has no significant effect on the HDI across 34 Indonesian provinces.

The positive effect of fiscal decentralization on the HDI can be explained through the lens of fiscal-federalism theory, which articulates the relationship between fiscal decentralization and public welfare (Christian & Ispriyarso, 2019). A central insight of this tradition is that subnational provision of public goods can generate allocative efficiency because local governments possess superior knowledge of local preferences and conditions than a distant central authority (Hayek, 1945). In the context of this study, this efficiency operates through three main mechanisms. First, the informational advantage of local governments enables them to allocate resources more efficiently toward education, health, and living-standards programs in line with actual local needs. Second, decentralization strengthens local governments' responsiveness to community needs through local democratic mechanisms. Third, greater fiscal autonomy encourages local governments to design and finance innovative programs in the delivery of public services.

The estimated coefficient of 0.14, which is positive and statistically significant, indicates that higher fiscal decentralization is associated with measurable gains in provincial human development. Interpreted through the fiscal-federalism framework, these efficiency gains can be traced to each constituent dimension of the HDI. In the health dimension, the informational advantage of local governments allows expenditure to be directed toward locally salient needs, such as expanding primary health facilities, immunization coverage, and maternal services in underserved areas, which is reflected in higher life expectancy. In the education dimension, greater responsiveness to community preferences enables provinces to address context-specific bottlenecks, for instance, school accessibility or teacher distribution, thereby supporting higher expected and mean years of schooling. In the living-standards dimension, allocative efficiency and locally tailored public investment can stimulate regional economic activity and raise per-capita income. Taken together, these channels explain why a marginal increase in fiscal autonomy translates into a positive and significant improvement in the composite HDI.

According to Nasution (2019), the implementation of decentralization aims to improve the efficiency of the central government's resource allocation and foster regional self-reliance, thereby enabling regions to become more independent in improving public welfare through human development. Through this, regions can achieve public welfare by enhancing human development, as reflected in rising Human Development Index (HDI) figures. Several redistributive policies implemented through fiscal decentralization are linked to programs that address poverty and basic needs, particularly in education and public health services (Martinez-Vazquez, 2003). These basic needs are among the dimensions used to calculate the HDI.

Education expenditure has a significant positive effect, with a coefficient of 0.35 ($p<0.01$), indicating that a 1 percent increase in education expenditure raises the HDI by 0.35 points. The effect of education expenditure on the HDI operates through improvements in the quality of human capital, which contributes to labor productivity and per capita income. This finding confirms that knowledge, as assessed by literacy and average years of schooling, is one of the three ultimate goals of development in the HDI assessment (BPS, 2015). Health expenditure has a significant positive effect, with a coefficient of 2.54 ($p<0.01$), indicating that a 1% increase in health expenditure raises the HDI by 2.54 points. This reflects the importance of investment in health for achieving human development, in line with the life expectancy dimension measured by life expectancy in the HDI calculation (BPS, 2015).

GRDP per capita, as a control variable, shows a highly significant positive effect with a coefficient of 6.86 ($p<0.01$). This finding indicates that every 1 percent increase in GDP per capita increases the HDI by 6.86 points. This relates to the standard of living dimension, which is measured by real per capita income adjusted for purchasing power parity in the HDI calculation (BPS, 2015). The open unemployment rate showed a positive coefficient of 0.09. However, it was not statistically significant ($p > 0.05$), indicating that this variable does not significantly influence the HDI in the research model. The poverty rate, as a control variable, showed a significant negative influence with a coefficient of -0.05 ($p < 0.05$). This finding indicates that a 1% increase in the poverty rate reduces the HDI by 0.05 points, confirming that poverty is the main constraint on human development.

The Impact of Fiscal Decentralization on Income Inequality

The regression results show that the degree of fiscal decentralization has a significant negative effect on income inequality, with a coefficient of -0.00 ($p<0.01$). These results are consistent with research by Akai and Sakata (2005), which suggests that fiscal decentralization can improve public-sector efficiency and reduce interregional disparities. However, these findings differ from the research by Izzati (2021), who found that the level of autonomy, proxied by the DDF variable, actually increased income inequality in the Special Region of Yogyakarta, and from Pietrovito et al. (2022), who revealed that revenue decentralization is negatively associated with intra-regional income redistribution across 183 regions in 14 OECD member countries.

The negative impact of fiscal decentralization on income inequality can be explained through the lens of fiscal federalism theory, particularly the 'new perspective' theories which emphasize the distribution of delegated authority in the management of revenue and expenditure through the harmonization of vertical and horizontal interactions (Musgrave, 1959; Oates, 2005; Darmawan, 2014). Fiscal decentralization aims to improve the efficiency of local governments in managing their respective regions, particularly in the public sector, thereby supporting economic growth and regional development (Sepulveda & Martinez-Vazquez, 2011). Policies implemented by local governments, taking into account the conditions and wealth of their region's natural and human resources (Nasution, 2019), are expected to accelerate regional economic growth and development, which in turn reduces income inequality.

Under the previous centralized approach, the central government held significant authority over policies assigned to regions, often resulting in inconsistent and ineffective policies. This was due to the central government's lack of understanding of the actual conditions in each region, leading to an uneven distribution of funds, whereby wealthier regions received a disproportionate share whilst poorer regions received a smaller share, thereby exacerbating regional disparities. Under the decentralized system, regions are expected to be more proactive in advancing their development by implementing policies suited to local conditions (Akai & Sakata, 2005). Education expenditure shows a significant negative effect on income inequality with a coefficient of -0.02 ($p<0.05$), indicating that every 1 percent increase in education expenditure reduces the Gini coefficient by 0.02 points. This finding is consistent with human capital theory, which posits that investment in education can reduce income disparities by equitably improving human capital quality.

According to Todaro and Smith (2011), income disparities are driven by variations in demographic characteristics and inequalities in access to human capital; therefore, equalizing access to education through increased spending can reduce these disparities. Health expenditure has a significant negative effect, with a coefficient of -0.00 ($p<0.01$). This reflects the importance of investment in health in reducing income disparities by increasing productivity and the population's workforce capacity.

GRDP per capita, as a control variable, shows a significant negative effect with a coefficient of -0.04 ($p<0.01$). This finding indicates that a 1% increase in GRDP per capita reduces the Gini coefficient by 0.04 points. This result is consistent with Kuznets' theory, which posits that in the early stages of development, income inequality tends to rise; however, in later stages, economic growth, reflected in rising GDP per capita, reduces inequality through the trickle-down effect. The open unemployment rate showed a positive coefficient of 0.00. However, it was not statistically significant ($p > 0.05$), indicating that this variable does not significantly influence income inequality in the research model. The poverty rate, as a control variable, shows a significant negative effect with a coefficient of -0.00 ($p<0.01$). This finding indicates that an increase in the poverty rate reduces the Gini coefficient, which can be explained by the fact that when the majority of the population is living in poverty, income distribution tends to be more equitable at a low level.

Although the open unemployment rate is not statistically significant in either the HDI or the GINI model, this control variable is retained in the final specification on theoretical and methodological grounds. Theoretically, unemployment is a standard determinant of welfare and income-distribution outcomes in the empirical fiscal decentralization literature (Fitriana & Agustina, 2019; Malau, 2022), so excluding it would deviate from the reference specifications on which the models are built. Methodologically, dropping a theoretically relevant control merely because it is individually insignificant risks omitted-variable bias in the coefficients of interest, whereas retaining it preserves the ceteris paribus interpretation of the fiscal decentralization

estimates (Gujarati, 2009). The insignificance of this variable is itself an informative finding: conditional on poverty, income per capita, and the fiscal variables, provincial unemployment does not exert an additional independent effect on the HDI or on inequality during 2017–2023. By contrast, the poverty rate remains significant in both models and is therefore substantively and statistically justified as a control.

■ CONCLUSION

Fiscal decentralization is found to be one of several factors supporting development, contributing through improved efficiency of resource allocation, as indicated by a significant positive coefficient for the HDI (0.14). This reflects the ability of local governments to respond to local needs more effectively. Nevertheless, this role should not be overstated: human development and income distribution are also shaped by macroeconomic conditions, the quality of local governance, infrastructure, demographic structure, and national social-protection programs, so fiscal decentralization operates alongside, rather than independently of, these factors. Fiscal decentralization can improve income distribution, as evidenced by a reduction in inequality (-0.00). The results of the quadrant analysis show a significant improvement in the relationships between fiscal decentralization and human development, and between fiscal decentralization and income inequality, for the period 2017–2023. In the relationship between DDF and HDI, the share of provinces in Quadrant I increased from 5.9% to 26.5%, while the share in Quadrant IV decreased from 61.8% to 41.2%. Meanwhile, the quadrant analysis of fiscal decentralization and the Gini coefficient shows an increase in the proportion of provinces with ideal conditions (high fiscal decentralization, low inequality) from 14.7% to 32.4%, with a decrease in the proportion of provinces in Quadrant IV from 23.5% to 11.8%. This transformation validates that fiscal decentralization can effectively enhance human development and reduce income inequality.

Therefore, local government policy should focus on (1) enhancing local fiscal autonomy through increased local revenue (PAD). This should be achieved through innovative revenue streams beyond taxes and fees. The central government needs to provide technical support and training to local governments in results-based budgeting, particularly for provinces with low fiscal autonomy such as Papua, West Papua, Maluku, and East Nusa Tenggara. A comprehensive monitoring and evaluation system needs to be developed to ensure that decentralized funds are used effectively, with a focus on increasing local revenue. (2) Local governments need to optimize budget allocation by prioritizing investment in infrastructure and productive economic programs that drive an increase in community income. Health expenditure allocations need to be increased due to their significant impact on human development and equity. Education expenditure should focus on programs with high distributional impact, such as early childhood education, vocational training, and scholarship programs for low-income families, to maximize the redistributive effect. (3) Provinces with good fiscal autonomy and low inequality need to maintain their performance through policy innovation and the diversification of local revenue sources. Provinces with good fiscal autonomy but high inequality, particularly those on the island of Java, need to focus on redistributive programs and the equitable distribution of access to public services. Provinces with low inequality but weak fiscal autonomy require fiscal capacity building by exploring local revenue potential and improving spending efficiency. Provinces facing the dual challenges of low fiscal autonomy and high inequality require comprehensive interventions that combine targeted transfers, capacity building, and integrated poverty alleviation programs. Poverty has proven to be the primary constraint hindering human development and perpetuating income inequality. The government needs to integrate poverty-alleviation programs.

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