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The Influence of Labor Market Dynamics on Development Inequality in Central Sulawesi Province

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Abstract. *This study aims to analyze the effect of labor market dynamics on development inequality in Central Sulawesi Province. Using panel data from 13 regencies/cities over the period 2015–2024, this study employs panel data regression with the Fixed Effect Model as the selected estimation approach based on the Chow Test and Hausman Test results. To address heteroskedasticity, autocorrelation, and cross-sectional dependence, robust estimation using Driscoll–Kraay Standard Errors was applied. The results show that the Open Unemployment Rate has a positive and significant effect on income inequality, indicating that higher unemployment widens income disparity. The Regional Gross Domestic Product per capita has a negative and significant effect, suggesting that inclusive economic growth contributes to reducing inequality. Meanwhile, the Labor Force Participation Rate has a negative but statistically insignificant effect. These findings imply that reducing unemployment and promoting inclusive economic growth are essential policy priorities to address development inequality in Central Sulawesi Province.*

Keywords:

*Inequality;
Development;
Labor Market*

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Introduction

Development inequality is a multidimensional issue that reflects the uneven distribution of income across regions and social groups, with significant implications for social justice and economic efficiency (Sugiastuti & Pratama, 2022; Ayyash et al., 2025). In Indonesia, income disparities between provinces and between regions remain a critical concern, as evidenced by the uneven Gini ratio and the dependence on labor market factors such as unemployment and labor force participation (Hasan et al., 2025). The Gini ratio in Central Sulawesi Province

increased from 0.305 in September 2022 to 0.309 in September 2024 (Central Bureau Of Statistic Of Central Sulawesi Province, 2025). Concurrently, the Regional Gross Domestic Product (GRDP) per capita in Central Sulawesi Province rose from IDR 56,577 (in thousands of rupiah) in 2022 to IDR 68,001 (in thousands of rupiah) in 2024 (Central Bureau Of Statistic, 2025). According to the Kuznets Hypothesis, income inequality tends to increase during the early stages of economic development and subsequently declines in later stages as structural economic transformation drives the reallocation of labor toward more productive sectors (Kuznets, 1995). However, empirical evidence from Central Sulawesi Province indicates that despite rising economic growth, the Gini ratio has not consistently decreased, thereby necessitating a re-examination of these theoretical assumptions within a regional context.

Furthermore, the unemployment rate and labor force participation rate in several areas of Central Sulawesi Province also reveal significant labor market challenges (Kustanto, 2024). The equitable distribution of employment opportunities constitutes an important element of labor market theory in explaining income distribution. Variables such as the Open Unemployment Rate (TPT) and the Labor Force Participation Rate (TPAK) can influence the Gini ratio, as limited labor absorption tends to widen income disparities (Mirah et al., 2020; Wulandari & Cahyono, 2026).

Based on the foregoing background, this study is considered urgent due to the discrepancy between theoretical predictions and empirical realities in Central Sulawesi Province. The novelty of this research lies in its use of panel data spanning the years 2015–2024, combined with employment-related variables—namely TPT, TPAK, and GRDP per capita—alongside a regional-level variable, the Gini ratio, integrated into a comprehensive regression model. Previous researchers such as Purnamasari et al., (2025) adopted the Williamson Index, Klassen Typology, and Location Quotient approaches with economic growth and regional development inequality as the tested variables. Their study did not incorporate or test labor market variables such as TPT or TPAK, focusing instead on economic development as a determinant of inequality. Similarly, Asykurunnizza et al., (2025) employed panel data regression but only examined income distribution inequality in relation to economic growth, per capita expenditure, life expectancy, mean years of schooling, poverty, foreign direct investment, and income inequality, without explicitly and comprehensively analyzing labor market variables. Therefore, this study provides more contextually relevant empirical evidence on the linkage between the labor market and development inequality, particularly given the distinct economic structure and labor characteristics of Central Sulawesi Province.

The research questions of this study are whether the Open Unemployment Rate (TPT), the Labor Force Participation Rate (TPAK), and GRDP per capita significantly affect development inequality in Central Sulawesi Province. Accordingly, the research hypotheses are as follows: (1) TPT has a significant positive effect on development inequality; (2) TPAK has a significant negative effect on development inequality; and (3) GRDP per capita has a significant negative effect on development inequality.

Research Methods

This study adopts a quantitative approach with an explanatory research design aimed at analyzing the effect of labor market dynamics on development inequality in Central Sulawesi Province. The research process commenced with a literature review to strengthen the theoretical foundation, followed by secondary data collection, data processing, statistical analysis, and the formulation of

conclusions and policy recommendations.

The scope of this study encompasses all regencies/cities in Central Sulawesi Province, with a focus on labor market indicators and development inequality over the period 2015–2024. The variables used to represent labor market conditions include the Open Unemployment Rate (TPT), the Labor Force Participation Rate (TPAK), and GRDP per capita, while the Gini ratio serves as the proxy for regional development inequality. Secondary data were sourced from official publications of the Central Bureau of Statistics at the regency/city level in Central Sulawesi Province. The Open Unemployment Rate is measured as the percentage of unemployed individuals relative to the total labor force; the Labor Force Participation Rate is measured as the percentage of the working-age population that is economically active; GRDP per capita is measured as the average value of the Regional Gross Domestic Product generated per person within a given area during a specified period; and the dependent variable, the Gini ratio, is measured based on the cumulative distribution of population income or expenditure, ranging from 0 to 1.

The data analysis technique employed is panel data regression analysis to identify the effects of independent variables on the dependent variable. Panel data consist of the combination of time series data and cross-sectional data compiled on an annual basis (Madany & Rais, 2022). The systematic formulation of the panel data regression model is as follows:

$$Y = \alpha + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + e_{it} \dots\dots\dots(1)$$

Where:

Y = Dependent variable (Gini Ratio)

α = Constant coefficient

β = Regression coefficient

x_1 = Independent variable 1 (TPT)

x_2 = Independent variable 2 (TPAK)

x_3 = Variabel independen 3 (GRDP per capita)

e = Error term

Three approaches are used to estimate the parameters of panel data regression models: the Common Effect Model, the Fixed Effect Model, and the Random Effect Model. The selection of the most appropriate estimation model is conducted through the following tests:

The Chow Test is used to determine the preferred model between the Fixed Effect Model (FEM) and the Common Effect Model (CEM). The hypotheses are:

H0: The appropriate model is the Common Effect Model (CEM)

H1: The appropriate model is the Fixed Effect Model (FEM)

This test is conducted by examining the significance of the FEM using the F-statistic. If the probability value (p-value) of F exceeds 0.05, then H_0 is accepted.

The Hausman Test is used to determine the preferred model between the Random Effect Model (REM) and the Fixed Effect Model (FEM). This test examines whether there is a correlation between the error term in the model and one or more explanatory (independent) variables. The hypotheses are:

H0: The appropriate model is the Random Effect Model (REM)

H1: The appropriate model is the Fixed Effect Model (FEM)

The Hausman test statistic follows a Chi-squared distribution with k degrees of freedom, where k is the number of independent variables. If the Hausman statistic exceeds the critical value, H_0 is rejected and the Fixed Effect Model is

deemed more appropriate. Conversely, if the Hausman statistic is less than the critical value, the Random Effect Model is preferred. Following the selection of the best model, classical assumption tests were conducted. Classical assumption testing is an important prerequisite in statistical analysis. According to Hutagol (2025) assessing model accuracy requires testing several classical assumptions, including heteroskedasticity, normality, and correlation.

Results and Discussion

This study utilizes panel data covering 13 regencies/cities over a 10-year period, yielding a total of 130 observations. The dependent variable is income inequality, proxied by the Gini ratio, while the independent variables include the Open Unemployment Rate (TPT), the Labor Force Participation Rate (TPAK), and the Regional Gross Domestic Product (GRDP) per capita.

To determine the model most suitable for the data characteristics, several statistical tests were conducted, including the Chow Test and the Hausman Test. The Chow Test is used to compare the Common Effect Model (CEM) with the Fixed Effect Model (FEM), while the Hausman Test determines the choice between the Fixed Effect Model (FEM) and the Random Effect Model (REM). The results of both tests serve as the basis for selecting the most appropriate panel data regression model for the analysis. The summary of the test results is presented as follows:

Table 1. Results of Panel Data Regression Model Selection Tests

Test Type	Test Statistic	df	p-value	Decision
Chow Test	F = 3.2627	(12,114)	0.0004544	FEM is more appropriate than CEM
Hausman Test	Chi-Sq 7.6001	= 3	0.05504	FEM is more appropriate than REM

Source: Rstudio, processed by the authors

The Chow Test results indicate a probability value of 0.0004544 (< 0.05), suggesting that the Fixed Effect Model is more appropriate than the CEM. Subsequently, the Hausman Test yielded a probability value of 0.05504, which is statistically at the margin of significance at the 10 percent level. Considering the data characteristics and the analytical objective of capturing inter-regional differences, the Fixed Effect Model (FEM) was selected as the primary model.

Table 2. Fixed Effect Model (FEM) Estimation Results

Variable	Coefficient	Std. Error	t-Stat	Prob.
TPT	0.010468***	0.003541	2.9559	0.0038
TPAK	-0.001425	0.000972	-1.4656	0.1455
PDRB Per Kapita	-1.82E-07***	5.84E-08	-3.1164	0.0023

Source: Rstudio, processed by the authors

Subsequently, classical assumption tests were conducted for heteroskedasticity and autocorrelation.

Table 3. Results of Heteroskedasticity and Autocorrelation Assumption Tests

Assumption Test	Test Statistic	df	p-value
Heteroskedastisitas (Breusch-Pagan)	BP = 9,8548	3	0,01984**
Autokorelasi (Breusch-Godfrey/Wooldridge)	Chi-sq = 44,063	10	3,21e-06***

Source: Rstudio, processed by the authors

The diagnostic test results reveal the presence of heteroskedasticity and autocorrelation. Consequently, re-estimation was performed using Driscoll–Kraay Standard Errors to produce more robust coefficients.

Table 4. Fixed Effect Model (FEM) Estimation Results with Driscoll–Kraay Standard Errors

Variable	Coefficient	Std. Error	t-Stat	Prob.
TPT	1.0468e-02	4.6257e-03	2.2630	0.0255264
TPAK	-1.4251e-03	9.8703e-04	-1.4438	0.1515332
PDRB Per Kapita	-1.8214e-07	5.3159e-08	-3.4263	0.0008518
R-squared: 0.17902				
Adj. R-Squared: 0.070992				
F-Statistic: 13.8833 on 3 and 10 DF, p-value: 0.00067435				

Source: Rstudio, processed by the authors

The FEM estimation results indicate that the Open Unemployment Rate (TPT) has a positive and statistically significant partial effect on the Gini ratio, meaning that an increase in TPT leads to greater income inequality. The Labor Force Participation Rate (TPAK) exhibits a negative coefficient but is not statistically significant, suggesting that changes in labor force participation have not been able to substantially explain variations in income inequality. Meanwhile, the Regional Gross Domestic Product (GRDP) per capita has a negative and statistically significant effect on income inequality, indicating that increases in GRDP per capita contribute to the reduction of income inequality.

The Effect of the Open Unemployment Rate on Income Inequality

The findings demonstrate that the Open Unemployment Rate has a positive and significant effect on income inequality. This indicates that rising unemployment directly widens the income distribution gap within society. This phenomenon occurs because when a segment of the population loses its source of income due to non-absorption into the labor market, those who remain employed—particularly in the formal sector with high productivity—tend to maintain or even increase their income levels. Moreover, when rising unemployment disrupts the equilibrium between production and consumption, hinders investment, and exacerbates poverty, these dynamics systematically widen inter-regional income disparities (Şenol & Onaran, 2023). The accumulation of these conditions ultimately results in an increasingly unequal distribution of income.

This finding is consistent with the research of Rizky et al. (2024) which demonstrated that increased unemployment significantly worsened income inequality in North Sumatra. Theoretically, this phenomenon reflects a regional

labor market that has not yet become inclusive, where the growth of employment opportunities fails to absorb the labor force equitably. In the context of developing regions, high unemployment often reinforces labor market segmentation and widens income disparities.

The Effect of the Labor Force Participation Rate on Income Inequality

The Labor Force Participation Rate (TPAK) exhibits a negative but statistically insignificant effect on income inequality. This suggests that increased labor force participation is not always accompanied by improvements in job quality or income equalization (Fee, 2022). The high TPAK in several areas is likely still dominated by the informal sector, characterized by low wages and limited productivity, such that its impact on income inequality remains relatively small (Binelli, 2016).

This condition indicates that an increase in the number of labor force participants does not necessarily reflect an improvement in the structure of the labor market. Many workers are absorbed into low-quality employment without social protection and with limited mobility opportunities. This observation is particularly relevant in the context of Central Sulawesi, which exhibits distinct economic structures and resource endowments across its regencies/cities. Areas that have developed as centers for mining, manufacturing, trade, and services possess different employment opportunity structures compared to those more dependent on agriculture and primary economic activities. Such differences in economic structure may cause increases in TPAK to produce divergent income effects across regions (Firstiani et al., 2026). In other words, two regencies/cities with comparable levels of labor force participation may not necessarily share the same income levels and income distributions, as the quality and productivity of available employment differ.

These findings can be elucidated through the lens of the Kuznets Hypothesis, which posits that the relationship between economic development and income inequality tends to follow an inverted-U curve. During the initial stages of development, the structural transformation of the economy from the traditional sector to the modern sector may increase inequality, as growth and productivity gains are initially concentrated in specific sectors, regions, and labor groups. As development progresses, employment opportunities in the modern sector expand, productivity increases, and the benefits of growth become more broadly distributed, thereby reducing inequality. Accordingly, an increase in TPAK alone is insufficient to reduce inequality. Policies should be directed toward enhancing the quality and productivity of employment, expanding the formal sector with adequate wages, promoting equitable inter-regional development, and strengthening education and workforce skills.

The Effect of GRDP on Income Inequality

The estimation results demonstrate that GRDP has a negative and significant effect on income inequality. This finding suggests that regional economic growth plays a role in reducing inequality, particularly when such growth is inclusive and capable of creating broader economic opportunities for the population (Dollar et al., 2016). Nevertheless, the relatively small magnitude of the coefficient indicates that economic growth alone is insufficient to address inequality without complementary policies for income distribution, cross-sectoral development equalization, and enhanced public access to education and the formal labor market (Lena et al., 2025).

Policy Implications

Based on the research findings, regional development policies should focus on reducing the unemployment rate through the creation of productive employment; improving the quality of the labor force, not merely its participation rate; and fostering inclusive economic growth so that the benefits of GRDP are distributed more equitably. A policy approach that integrates economic development and labor market strategies is expected to contribute to reducing inter-regional income inequality.

Conclusions and Recommendations

This study demonstrates that labor market dynamics play a significant role in shaping patterns of development inequality in Central Sulawesi Province. The Open Unemployment Rate is shown to exacerbate inter-regional income inequality, while economic growth, as reflected in GRDP per capita, contributes to reducing inequality when such growth is inclusive in nature. Conversely, the Labor Force Participation Rate has not been able to consistently promote income equalization, suggesting that the quantity of labor force participation alone is insufficient without concurrent improvements in the quality and productivity of the workforce. Accordingly, the first and third hypotheses of this study are statistically confirmed, whereas the second hypothesis is not significantly supported. Based on these findings, the regional government of Central Sulawesi Province is advised to prioritize policies that promote the creation of productive and high-quality employment to reduce unemployment, while simultaneously fostering economic growth that is evenly distributed across sectors and regions. Policies aimed at enhancing human resource quality through vocational education and job training should be strengthened to ensure that increased labor force participation genuinely contributes to income equalization. For future researchers, it is recommended that the scope of variables be expanded to include indicators such as regional minimum wages, government social expenditure, and infrastructure access, as well as employing a longer time horizon to obtain a more comprehensive understanding of inequality dynamics.

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