

Regional Heterogeneity in Employment Determinants: Evidence from Indonesia

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ABSTRACT

Research Originality: This study contributes to the literature by examining regional heterogeneity in employment determinants across Indonesia and underscoring the limitations of models relying solely on national aggregates.

Research Objectives: This study investigates the differential impacts of foreign direct investment, economic growth, education, and health on employment at the national level and across distinct regional clusters in Indonesia.

Research Methods: The study utilizes panel data regression covering 33 Indonesian provinces from 2011 to 2024, categorized into four regional clusters. Fixed- and random-effects models with robust standard errors are applied, with model selection based on formal specification tests.

Empirical Results: The findings reveal substantial regional variation regarding the magnitude and statistical significance of employment determinants. While specific variables show significant associations within certain regions, these relationships remain obscured in national aggregate data.

Implications: The results indicate that employment dynamics in Indonesia are inherently regional. Policymakers should prioritize regionally calibrated socioeconomic strategies over uniform national policies to effectively support employment expansion.

Keywords:

employment; foreign direct investment; economic growth, human capital; regional development

How to Cite:

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INTRODUCTION

Employment conditions are widely regarded as an important element of overall economic performance. Achieving full employment generally requires consistent, effective national-level policies. Failure to implement these policies risks high unemployment rates, which pose a severe threat to both national stability and individual welfare. Grounded in Okun's Law, high unemployment directly restricts economic growth and can leave a prolonged negative impact on the economy (Porrás-Arena & Martín-Román, 2023). These consequences extend beyond fiscal metrics and include the depreciation of human capital (Doppelt, 2019), weakened social cohesion (Pohlan, 2024), and a decline in public trust in government institutions (Popova et al., 2026).

In recent years, Indonesia has undergone substantial transformations, including shifts in production structures, uneven patterns of industrial development, and differing magnitudes of foreign investment across regions (Andriyani & Irawan, 2018; ASEAN Secretariat, 2024; Halim et al., 2025). These developments may impact the effectiveness of existing economic policies in driving employment expansion (Mulya, 2024). Such structural changes necessitate a re-evaluation of employment determinants, as traditional economic drivers may no longer yield the same labor-absorption outcomes in a changing industrial landscape. Consequently, further research using the most recent empirical data is essential to identify the evolving factors influencing job creation and to ensure that national policy frameworks remain responsive to these contemporary regional dynamics. Drawing from neoclassical growth theory and Okun's Law, economic output is fundamentally determined by the interplay of capital, labor, human capital, and technological progress. The existing literature suggests a positive elasticity among these variables, implying that labor absorption is not an isolated metric but is functionally dependent on the accumulation of other production factors (Ferrara, 2025; Porrás-Arena & Martín-Román, 2023; Wang & Wang, 2025). Therefore, expanding employment opportunities can be fostered strategically by enhancing capital investment and the quality of human capital.

Economic growth is widely viewed as a primary driver for supporting employment expansion. Within classical frameworks, rising output generates capital surpluses that can be reinvested into the economy. This increase in investment expands overall economic activity, which naturally requires more labor to meet the new production demands. Consequently, higher output levels tend to drive employment by increasing the total number of workers needed to sustain an expanded economy (Ferrara, 2025). Empirical studies have reported findings that are broadly consistent with this expected relationship (Astuti & Gunawan, 2024; Irshad & Hasan, 2022; Taqiyyuddin, 2023). Furthermore, foreign capital inflows represent another key channel through which employment expansion may occur (Nguyen et al., 2024). One mechanism operates through the expansion of production capacity and economic activity associated with incoming foreign capital (Hakim et al., 2023).

Additionally, foreign firms may introduce new technologies, managerial practices, and skills that generate spillover effects for the domestic labor market (Zhao et al., 2024). These benefits are not automatic, however, as the extent to which the local workforce

can absorb technological and knowledge spillovers depends on the availability of adequate human capital, particularly education (Badinger et al., 2019). From a broader theoretical perspective, growth frameworks emphasize that increases in capital accumulation and technological capability can support sustained output growth and, under certain conditions, lead to higher labor demand (Diebolt & Hippe, 2019). However, research in this area is far from uniform. Several studies report that foreign direct investment is positively associated with employment in certain contexts (Aderemi et al., 2022; Hakim et al., 2023; Nguyen et al., 2024; Tanaya & Suyanto, 2023), while others find insignificant or even negative relationships under different settings (Astuti & Gunawan, 2024; Irshad & Hasan, 2022; Jude & Silaghi, 2016; Taqiyyuddin, 2023).

Human capital represents another critical socioeconomic factor in the analysis of employment outcomes, as the emergence of human capital theory, research, and policy attention to education and health has become increasingly prominent. Classical theory emphasizes that education and health contribute to employment by enhancing productivity, employability, and workers' ability to adapt to technological change. Empirical evidence, however, does not provide uniform conclusions. Several studies find that education is positively associated with employment in certain contexts (Adejumo et al., 2021; Astuti & Gunawan, 2024; Raza et al., 2023), while others report insignificant or negative relationships depending on the settings of the analysis (Pinna et al., 2024; Raza et al., 2023). In contrast, improvements in health are more consistently linked to favorable employment outcomes across different studies (Pinna et al., 2024; Raza et al., 2023).

While a substantial body of literature has examined the relationship between socioeconomic factors and employment, the evidence remains insufficient to provide clear guidance for policy formulation in countries characterized by pronounced regional diversity, such as Indonesia (Black et al., 2025; Chen et al., 2021; Halim et al., 2025; Hill & Vidyattama, 2016). Most existing studies rely on national-level data, which implicitly assume that the effects of foreign investment, economic growth, education, and health on employment are homogeneous across regions (Irshad & Hasan, 2022; Nguyen et al., 2024; Pinna et al., 2024; Tanaya & Suyanto, 2023). This assumption is particularly restrictive in the Indonesian context, where regions differ markedly in economic structure, development stage, and labor market conditions (Halim et al., 2025).

Although several studies employ provincial-level data, many continue to estimate a single national model that treats provinces as a uniform analytical unit (Hafidz & Aida, 2025; Saraswati et al., 2022; Silvia et al., 2025; Tantra & Anandari, 2025). As a result, these studies do not test whether national-level estimates remain valid once regional heterogeneity is explicitly considered. In this setting, the use of provincial data does not substantially differ from national aggregation, as differences in regional employment responses are not directly modeled. Other studies focus on specific regions or selected provinces, which limits the generalizability of their findings to the broader national context (Astuti & Gunawan, 2024; Purwantoro et al., 2022; Santosa & Aisyah, 2025).

Moreover, much of the existing literature relies on earlier datasets, leaving employment dynamics up to 2024 largely unexplored. This gap is important because failing to account for regional heterogeneity may lead to aggregation bias and misleading empirical inference. National-level estimates may mask substantial differences in how employment responds to key socioeconomic factors across regions, increasing the risk that policy conclusions drawn from aggregate models are ineffective or poorly targeted. Without explicitly examining whether a single national model is sufficient, it remains unclear whether observed relationships reflect general patterns or region-specific dynamics. This study addresses these limitations by examining employment determinants in Indonesia using recent provincial data and by explicitly comparing national-level estimations with regional models.

The objective of this study is to assess and contrast how foreign direct investment, economic growth, education, and health are associated with employment at the national level and across regional clusters in Indonesia, and further to determine whether a single national model is sufficient to explain employment dynamics in a country characterized by substantial regional diversity. The novelty of this study lies in its explicit comparison of national and regional estimations, which enables an evaluation of whether a single national-level model adequately represents employment dynamics in a regionally diverse economy. By doing so, the study moves beyond treating Indonesia as a homogeneous unit. It provides empirical evidence on how the relationships between key socioeconomic factors and employment vary across regions with different economic and social characteristics.

METHOD

This study utilizes panel data regression employing fixed or random effects models, where the selection is determined through formal specification tests for each regional cluster. The dataset covers the period from 2011 to 2024. The analysis comprises 33 provinces selected based on the completeness of data availability throughout the observation period. Furthermore, this temporal scope was chosen specifically to ensure the completeness and consistency of the socioeconomic indicators.

To deepen the analysis, these provinces are further divided into four regional clusters: Sumatra, Java-Bali, Kalimantan-Sulawesi, and Eastern Indonesia. This study adopts a regional classification adapted from Akita (2003), with the primary modification being the consolidation of Kalimantan and Sulawesi into one regional grouping. Kalimantan and Sulawesi are combined due to their relatively small number of provinces and their economic structure dependent on commodities. The details regarding these shared commodity-based profiles are explicitly outlined in Presidential Regulation (Perpres) Number 12 of 2025, which identifies the primary sector dependencies common to both regions (Perpres No. 12/2025, 2025, Annex IV).

All variables and their definitions are presented in detail in Table 1. Employment (EMP) refers to the number of employed individuals within the working-age population. Foreign direct investment (FDI) is measured as the ratio of foreign investment inflows

to provincial GRDP. This measure is used to ensure comparability across provinces with different economic sizes. Economic growth is captured by the annual GRDP growth rate (GRDPG). Education is represented through two indicators: APK, which measures school participation at the basic and secondary levels, and RLS, which reflects the average duration of schooling and serves as a proxy for educational quality. Health capital is measured by life expectancy at birth (AHH).

To address differences in scale and variance, EMP and FDI are transformed into natural logarithms. Logarithmic transformations are commonly used in applied econometrics to reduce skewness and stabilize variance, particularly for variables with wide value ranges. GRDPG is not transformed because some observations take negative values. APK, RLS, and AHH remain in their original forms to preserve interpretability, as their scales do not require transformation. The empirical analysis relies on a panel regression framework.

Table 1. Operational Variables

Variables	Proxy	Code	Unit	Description	Data Source
Employment	Number of employed individuals	LNEMP	Persons (logged)	Represents the number of individuals who are employed within each province in a given year. This variable reflects the region's employment level.	Statistics Indonesia (BPS)
Foreign Investment	Ratio of realized FDI on economic growth	LNFDI	Ratio (logged)	Measures the ratio of realized foreign direct investment to provincial nominal GRDP. It indicates the extent to which provincial economic activity is supported by foreign capital inflows.	Statistics Indonesia (BPS) & Indonesia Investment Coordinating Board (BKPM)
Economic Growth	Gross Regional Domestic Product Growth	GRDPG	Percent (%)	Captures the annual growth rate of provincial real Gross Regional Domestic Product. This variable reflects the expansion of production activities and overall economic performance within a province.	
Education	Average Years of Schooling	RLS	Years	Indicates the average number of completed years of formal education among residents aged 15 and above. It is used as a proxy for education quality and accumulated human capital within a province.	Statistics Indonesia (BPS)
	Gross Enrollment Rate	APK	Percent (%)	Represents the average gross enrollment rate across primary and secondary education levels. It measures the extent of educational participation and access among the school-age population.	
Health	Life expectancy	AHH	Years	Reflects the average number of years a newborn is expected to live under prevailing mortality conditions. It serves as a key indicator of population health and overall human development.	

The general model estimated in this study is written as:

$$LNEMP_{it} = \alpha + \beta_1 LNFDI_{it} + \beta_2 GRDPG_{it} + \beta_3 RLS_{it} + \beta_4 APK_{it} + \beta_5 AHH_{it} + \varepsilon_{it}$$

Description:

$LNEMP_{it}$: Natural logarithm of employed individuals in province i at time t

α : Model intercept

$LNFDI_{it}$: Natural logarithm of foreign direct investment in province i at time t

$GRDPG_{it}$: Growth rate of Gross Regional Domestic Product in province i at time t

RLS_{it} : Average years of schooling in province i at time t

APK_{it} : Average Gross enrollment rate at the primary, junior secondary, and senior secondary levels in province i at time t

AHH_{it} : Average life expectancy at birth for both men and women in province i at time t

β_{it} : Slope coefficients of each explanatory variable on employment

ε_{it} : Error term

The empirical analysis is conducted using Stata. To determine the most appropriate model for the national data and each regional cluster, we employ the Chow test and the Hausman specification test. The Breusch and Pagan Lagrange Multiplier (LM) test is also applied where necessary to distinguish between common and random effects models. This allows the estimation strategy to vary (either FEM or REM) depending on the specific data characteristics of each region. To ensure the validity of our results, we use cluster-robust standard errors at the provincial level. This approach addresses potential heteroskedasticity and serial correlation, reducing the need for separate diagnostic tests for these assumptions (Abadie et al., 2022). The primary classical diagnostic retained is the Variance Inflation Factor (VIF) test, which we use to ensure that multicollinearity does not bias our estimates.

This study adopts one-tailed hypothesis testing, consistent with theoretical expectations regarding the directional relationship of the coefficients. Since statistical software reports two-tailed p-values, the probabilities are divided by 2 when the estimated sign aligns with the hypothesized relationship. Conversely, when the estimated sign contradicts the theoretical expectation, the null hypothesis is rejected regardless of the adjusted probability value. Descriptive analysis is conducted prior to the estimation stage to support the interpretation of the regression results. The analysis is presented using two primary indicators: the mean value of each variable by region and the coefficient of variation. These indicators are selected because they allow straightforward comparison and provide a clear overview of the data distribution and variability. Both measures are calculated using regional panel data covering the period from 2011 to 2024. No data transformation is applied in the descriptive analysis, as the purpose of descriptive statistics is to present the behavior of the variables in their original measurement scale and to offer a basic overview of the data structure. This descriptive assessment provides contextual

support for examining the determinants of employment and for highlighting differences in their relationships at the national and regional levels.

RESULTS AND DISCUSSION

The panel regression analysis yields several key findings that highlight substantial variation across national and regional models. Overall, the results show limited uniformity between the national estimate and regional clusters for most variables, except for school participation (APK), which does not exhibit a statistically significant relationship with employment at either the national or regional levels. Foreign direct investment shows a positive association with employment at the national level, with weak significance, whereas a stronger, statistically significant positive effect is observed in Sumatra. In contrast, the relationship between FDI and employment is not statistically significant in the remaining regions. Economic growth shows a weak but negative association with employment at the national level.

In contrast, positive, statistically significant effects are found in Java–Bali and Kalimantan–Sulawesi, with no significant relationship in other regions. Education quality, measured by average years of schooling (RLS), is not significant in the national model, shows a weakly significant negative relationship in Eastern Indonesia, and exhibits positive and significant effects in the other regional clusters. Health, proxied by life expectancy (AHH), demonstrates a positive, statistically significant association with employment at the national level, with significant positive effects also observed in Java–Bali and Eastern Indonesia, but remaining insignificant elsewhere. Taken together, these findings indicate pronounced regional heterogeneity and suggest that national-level models alone do not adequately capture the variation in employment determinants across Indonesia.

Model selection is conducted using a sequence of specification tests, namely the Chow test, the Hausman test, and the Breusch–Pagan Lagrange Multiplier (LM) test, with the results summarized in Table 2. The Chow test is first applied to determine whether the common effect is appropriate or whether unobserved heterogeneity across provinces should be accounted for through panel estimators. The consistently significant Chow test results across all models indicate that panel-based estimations are required. Subsequently, the Hausman test is employed to assess whether the fixed effects or random effects specification is more suitable by testing the consistency of the random effects estimator. Based on the Hausman test results, the random effects model is selected for the national, Sumatra, and Kalimantan–Sulawesi samples, while the fixed effects model is preferred for the Java–Bali and Eastern Indonesia clusters. The LM test is applied only when the Chow test indicates panel effects and the Hausman test fails to reject the random effects specification, to confirm the relevance of random effects relative to common effects. This sequential procedure ensures that each model specification is selected according to the underlying data structure of each regional cluster, rather than imposing a uniform estimation approach across regions.

Table 2. Model Specification Test

Test	National	Sumatra	Java - Bali	Kalimantan - Sulawesi	Eastern Indonesia
Chow Test (p-value)	0.00	0.00	0.00	0.00	0.00
Hausman Test (p-value)	0.6559	1.00	0.0010	0.9688	0.00
LM Test (p-value)	0.00	0.00	-	0.00	-
Selected Model	REM	REM	FEM	REM	FEM

Next, multicollinearity was assessed using the Variance Inflation Factor (VIF). The results in Table 3 indicate that all explanatory variables have VIF values well below commonly used thresholds, with none exceeding 3. This suggests that the explanatory variables are not strongly correlated with one another and that the degree of linear association among the regressors is relatively low. Consequently, the estimated coefficients are unlikely to be substantially distorted by multicollinearity, and each variable can be interpreted without concern that its effect is being masked or inflated by other predictors. Although VIF does not imply the complete absence of correlation among regressors, the consistently low values observed for both the national sample and all regional clusters indicate that multicollinearity is not a substantive issue in this study.

Table 3. Variance Inflation Factor (VIF) Test Results

VIF	National	Sumatra	Java - Bali	Kalimantan - Sulawesi	Eastern Indonesia
LNFDI	1.08	1.16	1.63	1.22	1.31
PDRBG	1.08	1.32	1.07	1.24	1.28
RLS	1.74	2.24	1.11	2.94	2.09
APK	1.47	2.33	1.34	2.30	2.02
AHH	1.32	1.15	1.88	2.40	1.70
Mean VIF	1.34	1.64	1.41	2.02	1.68

The descriptive statistics in Table 4 report the mean values and coefficients of variation for each variable within each regional cluster. The results indicate regional heterogeneity in Indonesia. A comparison of mean values shows that employment (EMP), foreign direct investment (FDI), and economic growth (GRDPG) exhibit noticeable variation across regions. This range of variation suggests that regional disparities are more pronounced for population and economic indicators. In contrast, differences in human capital indicators appear to be relatively more limited.

Furthermore, the coefficients of variation reveal substantial differences within and between regions. These patterns suggest that heterogeneity in socioeconomic conditions exists not only across regions but also within regions themselves. This finding underscores the relevance of adopting a regional clustering approach, as treating Indonesia as a single

national unit may obscure important variations in both the levels and relationships of the variables under study.

Proceeding to the estimation stage, this study examines the effects of the explanatory variables on employment at both the national and regional levels. For clarity and conciseness, the regression results are summarized in Table 5. For each specification, Wald or F tests are conducted, and the results indicate that all estimated models are statistically valid for interpretation. The discussion that follows interprets the estimated coefficients sequentially by variable. Descriptive statistics provide additional context on regional characteristics, helping clarify differences observed across regions. The estimation results reveal notable differences in the relationship between foreign direct investment and employment across models. At the national level, FDI is positively associated with employment, though the statistical significance is relatively weak. In contrast, the Sumatra cluster shows a stronger, positive association between FDI and employment, whereas no significant association is detected in the Java–Bali, Kalimantan–Sulawesi, and Eastern Indonesia clusters.

Table 4. Regional Comparison of Mean Values and Coefficient of Variation, 2011–2024

Variables	Measurement	National	Sumatra	Java - Bali	Kalimantan - Sulawesi	Eastern Indonesia
EMP	Coefficient of Variation	1.4063	0.6775	0.7792	0.5898	0.6632
	Mean	3,745,292	2,611,529	10,461,393	1,604,425	1,367,557
FDI	Coefficient of Variation	2.0596	0.9507	0.8369	1.2810	1.8608
	Mean	4.7%	2.03%	3.25%	4.84%	10.63%
GRDPG	Coefficient of Variation	0.6813	0.4849	0.5532	0.5610	1.0398
	Mean	5.02%	4.31%	4.79%	5.74%	5.28%
RLS	Coefficient of Variation	0.1250	0.0883	0.1414	0.1050	0.1552
	Mean	8.320	8.610	8.630	8.190	7.730
APK	Coefficient of Variation	0.0528	0.0403	0.0392	0.0445	0.0845
	Mean	0.929	0.942	0.926	0.918	0.928
AHH	Coefficient of Variation	0.0379	0.0150	0.0242	0.0367	0.0183
	Mean	69.65	69.87	72.45	69.50	66.24

The positive association observed at the national level and in Sumatra is broadly consistent with classical and endogenous growth frameworks, which suggest that additional investment can expand productive capacity and, under certain conditions, support

employment growth (Ferrara, 2025). Although indirect channels, such as technology or knowledge spillovers, are often discussed in the literature, they are not explicitly examined in this study. Therefore, the results should be interpreted as evidence of association rather than causal transmission. Comparing this result with the descriptive analysis, the significant positive effect in Sumatra may be attributed to the region having the lowest average FDI-to-GRDP ratio. This result might indicate that many of its provinces are still at an earlier stage of foreign investment absorption. Under such conditions, investment may generally flow towards expansion of production rather than efficiency improvements, consequently expanding employment (Jude & Silaghi, 2016). Sumatra also has relatively high mean values of RLS and APK, which may indicate a higher level of education that would enable local firms and stakeholders to benefit from spillover effects (Badinger et al., 2019; Jude & Silaghi, 2016).

Table 5. Summary of Estimation Results for National and All Regions

	National (REM Robust SE)	Sumatra (REM Robust SE)	Java-Bali (FEM Robust SE)	Kalimantan- Sulawesi (REM Robust SE)	Eastern Indonesia (FEM Robust SE)
C	5.082641	11.98551	13.0624	11.93376	-11.97771
Std. Err	3.980326	0.6434185	0.9771843	1.107184	9.364818
t/z stat	(1.28)	(18.63)	(13.37)	(10.78)	(-1.28)
LNFDI	0.0196361	0.0114359	-0.0065086	0.004641	0.0074227
Std. Err	0.146102	0.0042896	0.0063257	0.0046772	0.0273173
t/z stat	(1.34)*	(2.67)***	(-1.03)	(0.99)	(0.27)
GRDPG	-0.0043389	-0.0006244	0.0034017	0.0023267	-0.0074007
Std. Err	0.0027703	0.0021201	0.0006883	0.0006872	0.0055489
t/z stat	(-1.57)*	(-0.29)	(4.94)***	(3.39)***	(-1.33)
RLS	-0.0764033	0.2329648	0.1185925	0.1820665	-0.6506913
Std. Err	0.1566321	0.026671	0.0187446	0.0258466	0.3636104
t/z stat	(-0.49)	(8.73)***	(6.33)***	(7.04)***	(-1.79)*
APK	0.0016009	0.0022324	0.0004573	0.0012267	0.0097034
Std. Err	0.0020425	0.0020612	0.00034957	0.0023686	0.0108283
t/z stat	(0.78)	(1.08)	(0.13)	(0.52)	(0.90)
AHH	0.144421	0.0056091	0.0221601	0.0085734	0.4535228
Std. Err	0.763363	0.0108085	0.015157	0.0189628	0.1695865
t/z stat	(1.89)**	(0.52)	(1.46)*	(0.45)	(2.67)**
R-Square	0.3022	0.0049	0.8203	0.0476	0.4219

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively, based on one-tailed tests. Because the estimations use both fixed- and random-effects specifications, the reported test statistics differ by model: t-statistics are shown for FEM results, while z-statistics are shown for REM results. For model fit, the table reports the overall R-squared for REM and the within R-squared for FEM.

These findings partially align with previous studies that document a positive relationship between FDI and employment in specific contexts (Hakim et al., 2023; Nguyen et al., 2024; Rudatin et al., 2024; Tanaya & Suyanto, 2023). However, the

absence of significant effects in several regional clusters indicates that this relationship is not uniform across regions. The lack of statistical significance in these regions likely stems from differences in regional factor endowments, particularly in labor skill sets and urbanization levels. Evidence suggests that FDI location decisions in Indonesia are influenced by the availability of high-skilled human capital, leading to a 'skill-biased' labor demand (Halim et al., 2025; Ramdhan, 2025).

This result implies that the labor-absorptive capacity of FDI is not automatic but may depend on how well the investment requirements align with the existing local human capital stock and regional industry characteristics. This pattern is consistent with other empirical studies reporting insignificant or mixed effects of FDI on employment (Irshad & Hasan, 2022; Misnahwati, 2024; Simanora, 2025; Wulandari & Sishadiyati, 2023). Taken together, the contrast between the weakly significant national result, the stronger association in Sumatra, and the insignificant outcomes in other regions highlights substantial regional heterogeneity. These differences suggest that national-level estimations may not fully capture region-specific employment dynamics, supporting the view that a single national model is insufficient to explain the relationship between FDI and employment across Indonesia.

The estimated effect of GRDP growth on employment is mixed across the national and regional models. At the national level, the GRDPG coefficient is negative and only weakly statistically significant. This pattern does not align with the initial hypothesis or the standard growth expectation that higher output expansion is accompanied by greater use of production inputs, including labor (Ferrara, 2025). In practice, however, output can increase without a proportional rise in employment when growth is driven mainly by efficiency gains. When firms expand production through technological upgrading or highly capital-intensive processes, labor demand may remain unchanged or even decline, consistent with prior arguments that growth driven by efficiency can have limited employment effects (Hötte et al., 2023; Jude & Silaghi, 2016).

The negative national estimate is consistent with Tantra & Anandari (2025), who also report a negative association using Indonesian provincial panel data. Nevertheless, this national result should not be interpreted as a single dominant pattern, given that the regional estimations indicate heterogeneous relationships. In Java, Bali, and Kalimantan–Sulawesi, GRDP growth is positively associated with employment and statistically significant, whereas the estimates for Sumatra and Eastern Indonesia are not statistically significant. The lack of significance in certain regions may also be explained by the composition effect of regional growth, in which differences in factor endowment shape the characteristics of industries and how their labor markets respond to growth (Halim et al., 2025; Perpres No. 12/2025, 2025, Annex IV). The positive coefficients in some clusters align closely with studies documenting a positive growth–employment relationship in certain contexts (Astuti & Gunawan, 2024; Irshad & Hasan, 2022; Saraswati et al., 2022; Taqiyyuddin, 2023). Meanwhile, the insignificant results in other clusters are also consistent with evidence that does not find a robust relationship in some settings (Hamzah & Fitriyah, 2025; Ruslan & Pratomo, 2025). Overall, differences in coefficient direction and statistical significance across clusters indicate regional heterogeneity in the

relationship between GRDP growth and employment. This result further supports the interpretation that a single national model may not fully represent employment dynamics across Indonesia's regions, since aggregation can mask variation across clusters.

This study uses two education indicators: the gross enrollment rate (APK) and the average years of schooling (RLS). APK captures participation in basic and secondary education, while RLS reflects the accumulated duration of formal education completed by the population. These indicators represent different dimensions of education: APK focuses on enrollment coverage, and RLS captures educational attainment. The estimation results indicate that APK does not exhibit a statistically significant relationship with employment at either the national or regional levels. This finding is consistent with previous studies that employ similar measures and also report insignificant results for APK (Asmawati et al., 2025; Wulandari & Astuti, 2023). A plausible interpretation is that enrollment at the basic and secondary levels, while important for general access to education, may not be sufficient to directly influence employment outcomes, particularly when participation rates are already relatively high and exhibit limited variation.

In contrast, the results for RLS demonstrate a more heterogeneous pattern across regions. At the national level, RLS is not statistically significant, consistent with findings from several earlier studies (Sari & Setyowati, 2023). At the regional level, RLS shows a weakly negative and significant association with employment in Eastern Indonesia, a result also documented in recent empirical work (Amarta & Setiawati, 2025). Meanwhile, in Sumatra, Java, Bali, and Kalimantan–Sulawesi, RLS exhibits a positive, statistically significant relationship with employment. This positive association is consistent with a large body of empirical literature suggesting that higher educational attainment supports employment through improved productivity and employability (Hafidz & Aida, 2025; Romawati & Setiawati, 2025; Ruslan & Pratomo, 2025; Saraswati et al., 2022). The variation in these results suggests that the impact of educational attainment is closely tied to the regional labor market's characteristics. Improvement in educational attainment, particularly in regions with adequate job opportunities, may correspond to better alignment with formal labor-market requirements.

Moreover, additional schooling may increase the population's readiness to enter a sector that values higher qualifications (Munawaroh, 2021). Taken together, these findings indicate that the relationship between education and employment differs markedly across regions. While most regions show a positive association between educational attainment and employment, the contrasting result observed in Eastern Indonesia contributes to the absence of a significant relationship at the national level. This pattern illustrates the limitation of relying solely on national estimations, as aggregation may conceal important regional differences. The variation in both the sign and significance of the education coefficients across regions provides further evidence of regional heterogeneity and reinforces the argument that a single national model is insufficient to fully capture the role of education in shaping employment outcomes in Indonesia.

Health is proxied in this study by life expectancy at birth (AHH). The estimation results indicate a generally positive association between health and employment, although

the strength and statistical significance of this relationship vary across models. At the national level, AHH shows a positive and statistically significant relationship with employment. Similar positive effects are observed in the Java–Bali and Eastern Indonesia clusters, with the coefficient in Java–Bali being positive but only weakly significant. In contrast, the relationship between AHH and employment is not statistically significant in Sumatra and Kalimantan–Sulawesi.

The significant association in Java-Bali aligns with the region's relatively higher AHH in the dataset. AHH is often viewed as a broad indicator of socioeconomic development. Regions with more advanced development may possess labor markets that can better absorb improvements in the quality of labor supply (OECD, 2019). A similar pattern is observed in Eastern Indonesia, although the region has a lower AHH. In this scenario, improvements in health conditions may be more discernible in the data because they occur from a lower baseline.

The positive association between health and employment across several models is consistent with previous studies that document that improvements in population health tend to support labor productivity and labor market participation (Handayani et al., 2025; Pinna et al., 2024; Raza et al., 2023; Sajati & Pujiati, 2025). These studies suggest that healthier individuals are generally better able to participate in economic activity and sustain employment, findings that align with the significant results observed at the national level and in selected regions. Simultaneously, the absence of statistical significance in some regional models is also supported by earlier findings. A limited number of studies report insignificant relationships between health indicators and employment under certain regional or sectoral conditions (Sutrisna & Suasih, 2025). This result suggests that improvements in health do not always translate uniformly into employment gains, particularly when labor demand or economic structure differs across regions.

Overall, while the positive direction of the health coefficient appears relatively consistent across most models, the variation in statistical significance indicates that the magnitude and effectiveness of health improvements in supporting employment are not uniform across regions. This pattern highlights regional heterogeneity in the health–employment relationship. Consequently, the national-level result should be interpreted with caution, as it may not fully reflect how employment responds to health improvements across regions. These findings further reinforce the inadequacy of relying solely on a national model and underscore the importance of region-specific analysis when assessing the role of health in employment outcomes.

The results of this study consistently indicate regional heterogeneity in the determinants of employment. Across all variables examined, the magnitude, direction, and statistical significance of the relationships with employment differ across regions. No single determinant exhibits a uniform pattern that applies equally to all regional clusters, except APK. This variation suggests that employment dynamics in Indonesia are shaped by regional-specific economic and social conditions rather than by a single national mechanism. These variations may suggest that the unique factor endowments of

each region shape how socioeconomic factors relate to employment. For determinants such as FDI, economic growth, and human capital (education and health), the capacity for labor absorption may depend on the sectoral composition of the local economy. In clusters with high labor-intensity economic structures, these factors may show a stronger association with employment. Conversely, in clusters dominated by capital-intensive or resource-based sectors, the impact of these variables might be limited by the nature of the industries themselves. As the specific sectoral mechanisms were not empirically tested in this study, these observations remain theoretical and point to the importance of region-specific conditions in shaping employment outcomes.

The presence of such heterogeneity implies that models based on national aggregates, widely employed in previous research, may be insufficient to fully explain employment determinants in a country with substantial regional diversity. When relationships between key socioeconomic factors and employment differ across regions, national estimates risk masking important local dynamics. As a result, findings derived solely from national models should be interpreted with caution and may not be directly applicable as a basis for regional decision-making or policy formulation. By extension, employment policies designed using a uniform national approach may be less effective in addressing regional labor market conditions. Differences in how employment responds to investment, growth, education, and health across regions suggest that policy effectiveness is likely to vary spatially. This study highlights the limitations of analytical frameworks that apply a single standard across contexts and emphasizes the need for approaches in both empirical research and policy design that are calibrated to regional contexts. Through this contribution, the study encourages a more nuanced understanding of employment determinants that accounts for regional diversity rather than relying exclusively on aggregate national models.

CONCLUSION

This study analyzes the relationships among foreign direct investment, economic growth, education, health, and employment at both the national and regional levels in Indonesia, using provincial panel data from 2011 to 2024. The empirical findings demonstrate that these relationships vary substantially across regional clusters, exhibiting differences in both statistical significance and magnitude. In several instances, national-level estimations mask relationships that are clearly observed at the regional level, indicating that a single national model is insufficient to capture employment dynamics in a country with pronounced regional diversity. By contrasting national and regional results, this study confirms regional heterogeneity in employment determinants, thereby addressing the core research objective. These variations may reflect differences in factor endowments and sectoral composition specific to the region, although such mechanisms were not explicitly examined. Future research should therefore incorporate sectoral data to better identify the structural factors underlying labor absorption capacity within regions.

From a policy perspective, the results suggest that employment strategies based solely on national-level evidence may be ineffective. When the responsiveness of employment to investment, growth, education, and health differs across regions, uniform policy

interventions risk generating uneven outcomes. Employment and socioeconomic policies should thus be calibrated regionally, taking into account local economic structures, labor market conditions, and human capital characteristics. Such differentiated approaches are more likely to translate improvements in key development indicators into sustainable employment gains across Indonesia.

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