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Public Expenditure and Human Development Convergence in Eastern Indonesia 2015-2023

ABSTRACT

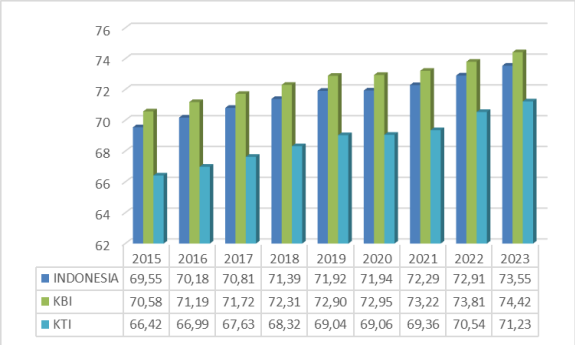
Human development in Eastern Indonesia still presents a broad picture compared to other regions, despite increased government spending on education, health, and social protection. This study aims to assess how public spending and socioeconomic conditions contribute to improvements in the Human Development Index (HDI) and to gauge whether there has been convergence in human development across provinces during the 2015–2023 period. Using a panel data approach, this study captures the dynamics of development across time and regions. The results indicate a trend toward convergence, with provinces with low HDI experiencing faster growth than those with high HDI, although the pace of alignment remains slow. Public spending and socioeconomic conditions play distinct roles in improving the HDI, with some sectors exerting a more substantial influence. These findings emphasise the importance of effective government spending allocation and improving socioeconomic conditions to accelerate human development and reduce regional disparities in Eastern Indonesia.
Keywords: Human Development Index, Public Expenditure, FD-GMM, Convergence
JEL Classification: O15, H50, C13, O47

INTRODUCTION

Development is a process aimed at improving the quality of human life by expanding capabilities, enhancing welfare, and fostering individual confidence and independence (Todaro, M. P., & Smith, 2011). In line with the United Nations Development Program's vision, human development aims to expand people's choices and opportunities through empowerment that enhances basic skills, enabling them to fully participate in various aspects of life (Apriska *et al.*, 2024). Human development is crucial for Indonesia because the quality of human resources is the primary foundation for the success of national economic and social development (Nizhamul, Istighfarah, and Damayanti, 2023). The availability of adequate human resources will automatically support the smooth implementation of development across various sectors (Nasrudin, Nurhidayah, and Rahwana, 2021).

Government intervention through public spending plays an important role in improving the quality of human resources, especially in disadvantaged areas (OECD, 2021). Government spending on education, health, and social protection is expected to accelerate equitable development across regions by increasing access to basic services (Economics *et al.*, 2024). However, BPS data shows that the gap in the Human Development Index (HDI) between the Western Region of Indonesia (KBI) and the Eastern Region of Indonesia (KTI) during 2015–2023 only narrowed from 4.16 points to 3.19 points, which indicates that the improvement of human quality in the Eastern Region of Indonesia (KTI) has not been optimally carried out (Central Statistics Agency, 2024). This condition is in line with the convergence theory, Barro, R. J. (1992), which explains that areas with low HDI should grow faster than areas with high HDI, although in practice this process is often hampered by structural and fiscal factors (Ginanjar *et al.*, 2024)

Figure 1. Comparison of the Average Development of the Human Development Index in the Western Region of Indonesia and the Eastern Region of Indonesia in 2015-2023



	2015	2016	2017	2018	2019	2020	2021	2022	2023
INDONESIA	69,55	70,18	70,81	71,39	71,92	71,94	72,29	72,91	73,55
KBI	70,58	71,19	71,72	72,31	72,90	72,95	73,22	73,81	74,42
KTI	66,42	66,99	67,63	68,32	69,04	69,06	69,36	70,54	71,23

Source: BPS (2015 - 2023), processed.

The development of the national Human Development Index (HDI), which increased from 69.55 in 2015 to 73.55 in 2023, shows an improvement in people's quality of life. However, the Human Development Index (HDI) of the Eastern Region of Indonesia (KTI) remains lagging behind the Western Region of Indonesia (KBI) even though the gap is narrowing, which indicates that the process of Convergence of human development has not been

optimally carried out (Wandirah & Setyono, 2024). Prolonged gaps risk undermining the effectiveness of national development, as low-quality areas tend to experience stagnant productivity and are more vulnerable to intergenerational poverty (Nurkse, 1953). The Eastern Region of Indonesia is important to study because it faces geographical barriers, limited infrastructure, and a high dependence on government fiscal intervention. From a policy perspective, an empirical evaluation of the effectiveness of public spending in the Eastern Region of Indonesia (KTI) is needed so that the allocation of education, health, and social protection spending not only increases the fiscal burden but actually results in an improvement in the quality of human resources (Wiratmoko and Purwanti, 2023).

To understand the mechanism of the relationship between the variables studied, this study refers to several main theories. Convergence Theory Barro, R. J. (1992). provides an analytical basis to assess whether areas with low HDI have improved faster than developed areas. Human Capital Theory, as explained by Schultz (1961) and Becker (1964), explains how investment in education and health improves people's productivity and well-being. Welfare State Theory and Musgrave, R.A., & Musgrave, (1989); Esping-Andersen, (1990) affirming the function of social protection spending in strengthening inclusion and equitable development. Meanwhile, the Cycle of Poverty Theory (Nurkse, 1953) and the Keynesian Employment approach (John Maynard Keynes, 1936) explain how poverty and unemployment can undermine human development.

Based on this theoretical framework, the relationship between variables in this study is assumed to be systematic and interrelated. Education and health spending is expected to have a positive effect on the Human Development Index (HDI) through improving the quality of human resources and community productivity. Social protection spending is expected to strengthen the dimension of decent living standards by reducing household economic vulnerability. In contrast,

poverty rates and open unemployment rates are assumed to negatively affect human development by limiting access to education, health, and employment opportunities. From a convergence perspective, the combination of effective public spending and improved socioeconomic conditions is expected to accelerate growth in the Human Development Index (HDI) in regions with lower initial development levels.

Previous research findings suggest that education and social protection spending tends to have a positive impact on human development, while the influence of health spending is often diverse and is primarily determined by the efficiency of budget management (Economics) *et al.*, 2024; Prasetyia, Wicesa & Finuliyah, 2026). In addition, poverty and unemployment have been shown to negatively affect the Human Development Index (HDI), although the level of significance varies across regions (Lumi, Kindangen, and Rorong, 2022; Riana & Khafid, 2022). However, most previous research has been limited to a single sector of public spending, to a specific region, or has not integrated fiscal and socioeconomic factors into a single comprehensive model. Studies on the dynamics of the Convergence of the Human Development Index (HDI) between provinces, especially in the Eastern Region of Indonesia, are also still relatively limited Prasetyia, Wicesa & Finuliyah, 2026), so it have not provided a comprehensive understanding of the causes of the slow improvement of human quality in the region. This condition creates a significant research gap: the need to simultaneously examine the influence of public spending and socioeconomic factors on the Human Development Index (HDI), and to assess whether the convergence process actually occurs in the Eastern Region of Indonesia (KTI).

Although previous studies have examined the influence of public spending and socioeconomic factors on human development, most continue to focus on a single sector of spending, use a static approach, or are limited to narrow regions and time periods. In addition, studies that specifically integrate public spending and socioeconomic conditions into a

dynamic panel analysis framework to examine the process of human development convergence across provinces, especially in the Eastern Region of Indonesia, remain relatively limited. Therefore, this study offers an empirical contribution by simultaneously analyzing the role of public spending and socioeconomic factors on the Human Development Index (HDI) and examining the dynamics of human development convergence in the Eastern Region of Indonesia during the period 2015–2023.

This research offers novelty by integrating the convergence analysis of human development and the influence of public spending and socioeconomic factors in a single dynamic panel data model. Unlike previous research, this study not only assesses the influence of each variable on the Human Development Index (HDI), but also examines whether provinces with low initial Human Development Index (HDI) in the Eastern Region of Indonesia experience faster growth than provinces with high HDI. Thus, this study makes a new empirical contribution to the literature on regional human development in Indonesia, especially in evaluating the effectiveness of fiscal policies in reducing inequality between regions.

Based on these gaps, this study aims to simultaneously analyze the influence of education spending, health spending, social protection spending, poverty rate, and open unemployment rate on human development in the Eastern Region of Indonesia during the 2015–2023 period, as well as test whether there is a convergence of human development between provinces. This analysis is expected to provide an empirical basis for the effectiveness of equitable development policies and to serve as a reference in formulating more effective public spending policies to accelerate improvements in the quality of human resources in disadvantaged areas.

RESEARCH METHODOLOGY

This study analyzes inequality between regions in the Eastern Region of Indonesia (KTI) using a convergence analysis approach. Convergence

analysis is basically a quantitative analysis that takes measurements using nominal data which is then statistically calculated. Therefore, this research falls under quantitative research (Rusydi, 2024). The data used in this study are secondary data obtained from official sources, such as the Central Statistics Agency (BPS) and the Directorate General of Financial Balance (DJPK) of the Ministry of Finance (Banase and Purwono, 2024). The research data in this study are panel data that combine cross-sectional and time-series data (Riana and Khafid, 2022). This study aims to test whether absolute and conditional Convergence occur in 17 provinces of the Eastern Region of Indonesia during the period 2015–2023, given the limited availability of data until the last year of observation (Khairina & Wijaya, 2023).

Table 1. Operational Research Variables

Yes	Variable	Description	Units	Source
1	Human Development Index (HDI) IPM_{it}	A measuring tool to assess the social and economic progress of a region, this index combines the calculation of education, health, and per capita income (Jajang et al., 2021; Todaro, M. P., & Smith, 2015).	Indeks	Central Statistics Agency (BPS)
2	Education Spending BP_{it}	The allocation of funds provided by the government to facilitate various programs and activities in the education sector (Hasibuan and Syahbudi, 2022).	Rupiah	Directorate General of Financial Balance (DJPK)
3	Health Shopping BK_{it}	Allocation of funds provided by the government to facilitate various programs and activities in the health	Rupiah	Directorate General of Financial

		sector (Nurvita) *et al.*, 2022; Nafi'Hasbi and Makhrus Munajat, 2023).		Balance (DJPK) Directorate
4	Social Protection Spending PS_{it}	Local government budgets allocated to protect communities from socioeconomic risks, such as poverty and social vulnerability	Rupiah	General of Financial Balance (DJPK)
5	Poverty Rate (P0) TK_{it}	The percentage of the population who live below the poverty line and are unable to meet basic needs properly.	Presses	Central Statistics Agency (BPS)
6	Open Unemployment Rate TPT_{it}	The percentage of the workforce that is unemployed but is looking for work in a given period.	Presses	Central Statistics Agency (BPS)

Source: *Author 2025*

This study uses a dynamic panel data model with an approach *First Difference Generalized Method of Moments (FD-GMM)*. The selection of the First Difference Generalized Method of Moments (FD-GMM) is based on the presence of a lag in the dependent variables in the model, which theoretically poses an endogeneity problem when estimated using IPM *Ordinary Least Squares* (OLS) or *Fixed Effect Model* (FEM) (Nurhamidah and Suhartini, 2014). Arellano, M., & Bond, (1991). affirmed that the First Difference Generalized Method of Moments (FD-GMM) effectively overcame the bias due to endogenicity, autocorrelation, and heteroscedasticity in the dynamic panel model through a first-difference transformation that eliminates the individual effects of unobservable individuals.

The First Difference Generalized Method of Moments (FD-GMM)

approach was chosen over the System Generalized Method of Moments (SYS-GMM) because the research data structure has a relatively short time dimension compared to the number of observation units (N > T), so the use of the First Difference Generalized Method of Moments (FD-GMM) is considered more appropriate to maintain the stability of the instrument and avoid instrument proliferation problems. In addition, the First Difference Generalized Method of Moments (FD-GMM) allows the use of endogenous variable lags as valid internal instruments, yielding a consistent and efficient estimator for analyzing the dynamics of human development. Findings Astusi *et al.*, (2025) shows that the First Difference Generalized Method of Moments (FD-GMM) produces unbiased and consistent estimates in the analysis of the dynamics of the Human Development Index in Indonesia, in line with Nurhamidah and Suhartini, (2014) which states that FD-GMM produces lower bias than FEM and PLS. Therefore, the First Difference Generalized Method of Moments (FD-GMM) is considered the most suitable for analyzing the dynamics of the Human Development Index (HDI) and the process of human development convergence in the Eastern Region of Indonesia (KTI).

Estimation is made using Eviews 12 software (Wandirah & Setyono, 2024). The validity of the instrument is tested using *the Sargan Test*, in which the instrument is declared valid if the null hypothesis (H_0) is not rejected. Model consistency was evaluated using the Arellano autocorrelation test–Bond, with good model criteria indicated by the existence of autocorrelation in the first order AR(1) but not in the second order AR(2). In addition, the lag coefficient between the Pooled Least Squares (PLS) and Fixed Effect Model (FEM) estimates indicates that the First Difference Generalized Method of Moments (FD-GMM) estimates are stable and unbiased IPM_{it}(Stuttgart) *et al.*, 2025; Balighoh and Tsani, 2025).

To measure inequality in human development across regions, σ analysis (sigma convergence) is used, which indicates that the variance of the log

Human Development Index (HDI) between provinces decreases from year to year. This approach follows common practice in regional convergence studies to assess the dynamics of inequality in human development.

$$\sigma_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(\ln(y_t) - \ln(y_t))^2} \ldots (1)$$

Description:

y_{it}= Provincial HDI *value in* year *t*

$\overline{\ln(y_t)}$= log average (HDI) of all provinces in year *t*

N= number of provinces

σ_t= level of inequality between regions in year *t*

This research model was developed with reference to the dynamic convergence framework Nurhamidah and Suhartini, (2014) because it is relevant to analyze the process of Convergence of the Human Development Index (HDI) through an autoregressive approach. The regression model is arranged in semi-log form, with the variables of public expenditure transformed into logarithms to standardize the data scale, reduce heteroscedasticity, and allow interpretation of the elasticity of fiscal policy to the Human Development Index (HDI), while the variables of poverty and open unemployment rate (TPT) remain at the level because they have been in the form of percentages (Hidayat and Yulianita, 2025). The empirical model of the research is formulated as follows:

$$IPM_{it} = \beta_1 IPM_{i,t-1} + \beta_2 \ln BP_{it} + \beta_3 \ln BK_{it} + \beta_4 \ln PS_{it} + \beta_5 TK_{it} + \beta_6 TPT_{it} + \varepsilon_{it} \ldots (2)$$

With:

IPM_{it} : Human Development Index Figures

BP_{it} : Provincial Education Expenditure

BK_{it} : Provincial Health Expenditure

PS_{it} : Provincial Social Protection Expenditure

TK_{it} : Poverty Level (P0) Province

TPT_{it} : Provincial Open Unemployment Rate

ln : Logarithmic Transformation

$\beta_1\beta_2\beta_3\beta_4\beta_5\beta_6$: The regression coefficient for each independent variable

ε_{it} : Residual

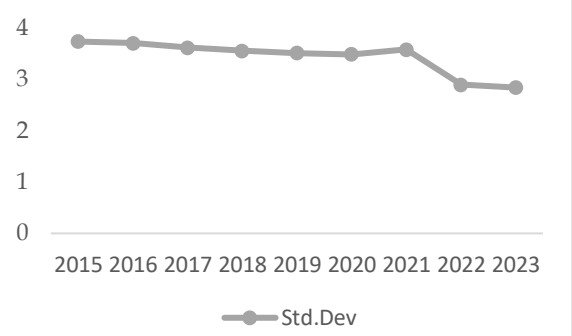
i : Provinces in the Eastern Region of Indonesia

t : Time (2015 – 2023)

RESULT AND DISCUSSION

The analysis of the Convergence of human development in the Eastern Region of Indonesia for the period 2015 to 2023 was carried out by including several variables that are suspected to play a role in accelerating the process of narrowing the gap between regions, such as government spending in the fields of education, health, and social protection, as well as socioeconomic factors in the form of poverty rate (P0) and open unemployment rate. The analysis was carried out through the stages of selecting the most suitable panel data model, testing classical assumptions and model feasibility, and interpretation of the estimation results. Through this approach, the research is expected to describe the relationship between fiscal policy and social conditions and the increase in the Human Development Index, and to assess whether there is a process of convergence among provinces in the region.

Figure 1. Interprovincial σ-convergence trend in Eastern Indonesia, 2015–2023



Source: BPS (2015-2023), processed

The σ-convergence analysis was conducted to examine changes in the dispersion of the Human Development Index (HDI) across provinces over time. The results show that the standard deviation of the Human Development Index (HDI) across provinces decreased by 24% from 2015 to 2023, indicating a narrowing of variation in human development between regions. In other words, the human development gap in the Eastern Region of Indonesia is

starting to show a decreasing direction even at a limited pace. β-convergence analysis examines the extent to which areas with low levels of human development can catch up with those with higher levels. In the context of this study, β-convergence was measured using a dynamic panel model with the Generalized Method of Moments (GMM), with the Human Development Index (HDI) as an explanatory variable. The value of the Human Development Index (HDI) coefficient of less than one indicates a convergence process, where provinces with low Human Development Index (HDI) in the initial period grow faster than provinces with high Human Development Index (HDI).

This approach provides an empirical overview of the dynamics of the Convergence of the Human Development Index (HDI) between provinces in the Eastern Region of Indonesia during the 2015–2023 period. Using *the First Difference Generalized Method of Moments (FD-GMM*) model, this analysis not only measures the speed of narrowing the gap between regions, but also takes into account the effects of fiscal policy and socioeconomic conditions, such as government spending in education, health, social protection, poverty, and open unemployment rates. The results of this β-convergence test are expected to strengthen empirical evidence on whether human development policies in disadvantaged areas have been effective and lead to a reduction in disparities between provinces.

A significant coefficient of 0.70 indicates that the interprovincial Human Development Index (HDI) in the Eastern Region of Indonesia is moving towards a long-term equilibrium ($IPM_{i,}$ *t-1 steady state*). Value β Approaching one indicates a slow convergence process, meaning that the reduction of the gap between regions takes place gradually. This phenomenon supports the convergence theory (Barro, R. J., 1992), where areas with low levels of development will grow faster than areas with high levels of development, provided that fiscal and social policies are consistently implemented.

Descriptive statistics aim to provide a preliminary explanation of the

data used in the research and to help understand the data's characteristics in general. Table 2 presents descriptive statistics showing the influence of several indicators on the Human Development Index (HDI). Several variables are transformed into the Lnarhythm form. Displays the results of data processing in the form of numbers that contain minimum, maximum, mean, and standard deviation values. The following are the results of data processing using the Eviwes 12 program (Wandirah and Setyono, 2024):

Table 2. Descriptive Statistical Test Results

Variable	Units	Obs	Red	Std.dev.	Min	Max
IPM_{it}	Table of	153	68.73281	3.774456	57.25000	78.20000
$\ln BP_{it}$	Contents	153	27.69559	0.691736	25.69122	29.04508
$\ln BK_{it}$	Rupiah	153	26.72089	0.678322	24.95031	28.38075
$\ln PS_{it}$	Rupiah	153	24.61690	0.511810	22.83838	25.82361
TK_{it}	Rupiah	153	12.41876	6.662067	4.290000	28.54000
TPT_{it}	Presses	153	4.728954	1.516713	2.270000	9.930000
	Presses					

Source: Data processing results for 2015-2023 (Output Eviews 12)

Based on the test results, the Human Development Index (HDI) variable has a minimum value of 57.25, a maximum of 78.20, an average of 68.73, and a variability of 3.77. Furthermore, the variable Education Expenditure (BP) has a minimum value of 25.69, a maximum value of 29.04, an average of 27.69, and a variability of 0.69. The Health Expenditure (BK) variable has a minimum value of 24.95, a maximum of 28.38, an average of 26.72, and a variability of 0.67. The Social Protection Expenditure (BPS)

variable has a minimum value of 22.83, a maximum of 25.83, an average of 24.61, and a variability of 0.51. The Poverty Level variable (P0) has a minimum value of 4.29, a maximum of 28.54, an average of 12.41, and a variability of 6.66. The Open Unemployment Rate (TPT) variable has a minimum value of 2.27, a maximum of 9.93, an average of 4.72, and a variability of 1.51.

In *the First Difference Generalized Method of Moments (FD-GMM*) model, the unbiased test was performed by comparing the lag results of *the First Difference Generalized Method of Moments (FD-GMM*) between the *lag of the Fixed Effect Model* and *the Common Effect Model*. The following are the results of the bias test on the *First Difference Generalized Method of Moments (FD-GMM*) model*:*

Table 3. Results of the Unreliability Test

Models	**Coefficients**
Fixed Effect Model	0.883267
Generalized Method Moments	0.704606
Commond Effect Model	0.965011

Source: Data processing results for 2015 - 2023 (Output Eviews 12*)*

In Table 3 above, it can be seen that the value of the *Generalized Method of Moments* lag coefficient is between *the Fixed Effect Model* and *the Common Effect Model* where the value of the FEM lag coefficient < FD-GMM < CEM is 0.883267 < 0.704606 < 0.965011, meaning that the model used is unbiased, consistent, and efficient. Based on the test results, it can be concluded that the direction and significance of the leading coefficient are relatively consistent between methods, but FD-GMM was chosen as the main estimator because it is better able to overcome the endogeneity and dynamics of HDI, which indicates that the variables in the model are not subject to bias. Thus, the resulting estimates are stable and consistent, making it feasible to test the dynamic relationships among variables in the convergence model of human development in the Eastern Region of Indonesia.

This section presents the results of the income convergence estimate

obtained using the *First Difference Generalized Method of Moments (FD-GMM*) with a *two-step estimator*, as shown in Table 4. The variable coefficient is positive and significant at the 5% level, indicating conditional convergence across regions. Based on the results in Table 3, it can be seen to what extent the model meets the criteria for an $IPM_{i,}$ *t-1 good First Difference Generalized Method of Moments (FD-GMM*) model, namely instrument validity, estimation consistency, and unbiased parameter estimates.

Table 4. Results of First Difference Generalized Method of Moments (FD-GMM)

Variable	Coefficients	Std. Error	t-Stat.	Prob.
$IPM_{i,t-1}$	0.704606	0.330816	2.129907	0.0491**
$\ln BP_{it}$	0.262530	0.191536	1.370651	0.1894
$\ln BK_{it}$	-1.959221	1.081373	-1.811791	0.0888*
$\ln PS_{it}$	1.280321	0.260764	4.909889	0.0002**
TK_{it}	-0.734615	0.305707	-2.403007	0.0287**
TPT_{it}	-0.533578	0.208528	-2.558784	0.0210**

Note: *significant 10%, **significant 5%, ***significant 1%

Source: Data processing results for 2015 - 2023 (Output Eviews 12*)*

The results of the estimation using *the First Difference Generalized Method of Moments* (FD-GMM) show that the Human Development Index variables have a positive and significant effect on the current Human Development Index (HDI), with a coefficient of 0.704606 and a significance level of 5%. These findings indicate a dynamic effect and potential Convergence in the Eastern Region of Indonesia, where provinces with low Human Development Index (HDI) levels tend to experience faster growth than provinces with higher Human Development Index (HDI).$IPM_{i,t-1}$

Table 5. Calculation of Human Development Convergence

Convergence Indicators	Value
Coefficients $IPM_{i,t-1}$	0,7046
β Convergence $(1-\alpha)$	0.295394
Speed of Convergence (λ)	0.350116
Half-Life (years)	1.979761

Source: Data processing results for 2015 - 2023 (Output Eviews 12*)*

Based on the Human Development Index (HDI) lag coefficient of 0.704606, a convergence β value of 0.2954 was obtained, indicating an adjustment process towards a steady-state level of human development. Furthermore, the value of the speed of Convergence calculated using the formula λ = −ln(α) is 0.350 or 35.0% per year. This indicates that regions with lower levels of early human development can catch up with more advanced regions at relatively high speeds. In addition, the half-life convergence value of 1.98 years shows that it takes less than two years to close the half-gap in the Human Development Index (HDI) between regions.

Education spending has a positive coefficient of 0.2625, but it is not statistically significant. These findings are not entirely in line with human capital theory that emphasizes the role of education in improving the quality of human resources, but are consistent with a number of empirical studies that state that the influence of education spending is highly dependent on the efficiency of allocation, the quality of institutions, and the accuracy of program targets, especially in disadvantaged areas.

Health Expenditure showed a negative, marginally significant influence at the 10% level, with a coefficient of -1.9592. These findings are not entirely in line with human capital theory that emphasizes the role of education in improving the quality of human resources, but are consistent with a number of empirical studies that state that the influence of education spending is highly dependent on the efficiency of allocation, the quality of institutions, and the accuracy of program targets, especially in disadvantaged areas.

Social protection spending has a positive and significant effect on HDI, with a coefficient of 1.2803, supporting the theory of welfare and social protection that government intervention through social assistance can improve decent living standards and reduce household economic vulnerability. These findings are consistent with various empirical studies that confirm the effectiveness of social protection programs in promoting human development, especially in areas with high poverty rates.

Furthermore, the poverty rate has a negative and significant effect on HDI, with a coefficient of -0.7346, consistent with development theory and empirical evidence that poverty limits people's access to education, health, and economic opportunities. Similarly, the open unemployment rate has a significant negative effect with a coefficient of –0.5336, confirming the theoretical view that unemployment lowers the quality of life and inhibits the accumulation of human capital, thereby slowing down the process of human development convergence between regions.

Overall, the results of this estimate confirm that the increase in the Human Development Index (HDI) in the Eastern Region of Indonesia depends not only on the size of the public budget but also on fiscal efficiency, the direction of social policy, and regional institutional capacity. The use of the FD-GMM method in this study was chosen because it was able to capture the short-term dynamics of the Human Development Index (HDI) and overcome the problem of endogeneity

between fiscal and socioeconomic variables. By including the Human Development Index (HDI) as an explanatory variable, this model allows for a more accurate analysis of the process of human development convergence, i.e., the extent to which areas with low levels of development are able to catch up with more developed areas. Positive and significant results provide empirical evidence that the process of Convergence of the Human Development Index (HDI) in the Eastern Region of Indonesia is indeed occurring, although the pace remains relatively slow and requires more efficient and inclusive fiscal policy support.$IPM_{i,t-1}$

This study uses the Sargan test to assess the instrument's validity. This test aims to evaluate whether the instrument used is valid, especially in over-identifying conditions, namely, when the number of instruments exceeds the estimated number of parameters. The decision-making in this study refers to a probability value with a significance level (α) of 0.05. If the probability value is greater than (α) of 0.05, then the instrument used is considered valid, because it meets the assumption of *orthogonality condition* or *moment restriction condition* in the FD-GMM model. Conversely, if the p-value is less than 0.05, the instrument is considered invalid, indicating a correlation between the instrument and the residual, and the model does not meet validity requirements. In addition to testing the instrument's validity, the Sargan test also tests whether the FD-GMM residuals exhibit heteroskedasticity. The following Table 3 presents the results of the Sargan test:

Table 6. Sargan Test Results

Test Statistic	Prob.
J-statistic	3.367417
Prob(J-statistic)	0.984926

Source: Data processing results for 2015 - 2023 (Output Eviews 12)

In Table 5, the results of the Sargan test indicate that the J-statistic probability value (3.367417) is> 0.05 (α = 5%), indicating that the model is valid and that the instrument's variables do not correlate with errors. This indicates that the instrument variable is uncorrelated

with the error *term*, thereby satisfying the exogeneity assumption. In addition, these results indicate that the model does not exhibit significant heteroscedasticity, so the estimates obtained are efficient and reliable.

To test the consistency of the estimation results, autocorrelation was assessed using the Arellano-Bond statistics. This test aims to ensure that the error term does not experience serial autocorrelation at the 2nd lag [AR(2)]. In other words, the estimate is considered consistent if no autocorrelation is found, under the null (H_0) hypothesis that there is none in the model. The Arellano–Bond test is used not only to verify the consistency of the estimated results but also to detect autocorrelation in dynamic models. Decision-making is based on the probability value of the second-order autocorrelation test (AR(2)); if the probability value of AR(2) is greater than the significance level (α = 0.05), then H_0 is accepted. This condition indicates that the consistency requirements have been met and the model is not autocorrelated. Thus, the estimation results are reliable and accurately reflect the dynamic relationships between variables. The following are the results of the Arellano–Bond test:

Table 7. Arellano-Bond Test Results

Test order	m-Statistic	rho	OR(rho)	Prob.
AR(1)	-0.293155	-90.87879	309.975787	0.7694
AR(2)	-0.698637	-7.311646	10.465580	0.4848

Source: Data processing results for 2015 - 2023 (Output Eviews 12*)*

In Table 6, the results of the Arellano-Bond Test are obtained, which show that the prob value of AR(2) is 0.4848 > 0.05 with a significance level of α = 5% or 0.05, meaning that there is no autocorrelation problem, so that the estimate is consistent.

The results of the study show that human development in the Eastern Region of Indonesia (KTI) is experiencing conditional Convergence,

albeit at a relatively slow pace. A significant coefficient confirms that provinces with lower initial development rates tend to grow faster than more developed provinces ($IPM_{i,t-1}$; Barro, R. J., 1992). However, the slow decline in inequality is evident in the reduction in σ-convergence, which was only around 24% during 2015–2023, indicating that structural factors, such as infrastructure disparities and regional fiscal capacity, still hinder faster convergence. In addition, the results of this study reinforce the latest empirical findings that show that the Convergence of the Human Development Index (HDI) in the Eastern Region of Indonesia (KTI) is conditional and strongly influenced by the fiscal capacity and structural characteristics of the region (São Paulo *et al.*, 2024; Prasetyia, Wicesa & Finuliyah, 2026). However, the low rate of decline in provincial inequality indicates that structural barriers still limit the acceleration of human development convergence in the Eastern Region of Indonesia (KTI) relative to the Western Region of Indonesia (KBI).

In the context of public spending, education expenditure shows a positive but insignificant influence on the Human Development Index (HDI). This result indicates that the increase in allocation has not fully translated into an improvement in human quality. This inconsistency is contrary to the predictions of human capital theory (Becker, 1964), which expects an education multiplier effect through increased productivity and employment opportunities. However, the results of this study are in line with the latest empirical findings that show that an increase in education spending does not necessarily have a significant impact on the Human Development Index (HDI) if it is not accompanied by improvements in service quality, equal access, and efficiency of budget management (Riana & Khafid, 2022; São Paulo *et al.*, 2024). Thus, the results of this study show that in underdeveloped areas such as KTI, education spending tends to have a long-term impact and has not accelerated HDI convergence in the short term.

In contrast to the variable of education spending, the variable of health expenditure actually shows a significant negative influence on the Human Development Index (HDI), confirming the existence of serious inefficiencies in the management of the health budget in the Eastern Region of Indonesia (KTI). However, these findings align with recent empirical research showing that in disadvantaged areas, health spending is often ineffective due to the dominance of administrative spending and the low quality of basic health services (Ginanjar *et al.*, 2024; Prasetyia, Wicesa & Finuliyah, 2026). In a convergence perspective, these results show that health spending in the Eastern Region of Indonesia (KTI) has not been able to encourage the acceleration of human development as predicted by theory, but is one of the factors that slows down the narrowing of the Human Development Index (HDI) gap between regions (Barro, R.J., 1992).

On the other hand, social protection spending has yielded significant positive results and is the most consistent fiscal variable in increasing the country's Human Development Index (HDI). Eastern Region of Indonesia (KTI). These results show that programs such as the Family Hope Program (PKH) and other social assistance programs can directly reduce vulnerability and increase people's access to basic needs. Theoretically, these results show that fiscal intervention through social protection spending can encourage the Convergence of human development in underdeveloped areas by accelerating increases in the Human Development Index (HDI) in provinces with a low welfare base. In addition, the results of this study support recent empirical findings that social protection spending directly improves welfare, especially in areas with high poverty rates (Economics *et al.*, 2024; Prasetyia, Wicesa & Finuliyah, 2026). This shows that social protection spending is more effective at accelerating increases in the Human Development Index (HDI) than spending in other sectors in the Eastern Region of Indonesia (KTI).

On the socioeconomic side, the P0 poverty level variable showed a significant adverse effect on the Human Development Index (HDI), confirming that areas with higher poverty levels experienced a decline in human development quality. Despite the poverty cycle theory, Nurkse (1953) stated that fiscal intervention can break the cycle of poverty. The results of this study show that poverty in the Eastern Region of Indonesia (KTI) is structural and requires greater intervention to produce real development effects. These findings are also in line with recent empirical research, which found that poverty is the main factor inhibiting increases in HDI in disadvantaged areas (Prasetyia, Wicesa and Finuliyah, 2026). Thus, reducing the poverty rate is an important determinant in increasing the Human Development Index (HDI) in the future.

Finally, the open unemployment rate has also been shown to have a significant negative effect on the Human Development Index (HDI). In the context of Convergence, unemployment is one of the factors that slow the narrowing of the gap in the Human Development Index (HDI) between provinces, because high unemployment leads to an uneven income increase. These findings are consistent with the theory of John Maynard Keynes (1936), which emphasizes that high unemployment weakens aggregate demand and lowers welfare. Empirically, this study's results are consistent with recent studies showing that unemployment slows the increase in the Human Development Index (HDI) and increases regional development inequality (Prasetyia, Wicesa, and Finuliyah, 2026). Efforts to increase the Human Development Index (HDI) in the Eastern Region of Indonesia (KTI) require employment policies that encourage the creation of productive jobs, especially for vulnerable groups, which have been the highest contributors to the unemployment rate.

Overall, the study's results show that the Convergence of human development in the Eastern Region of Indonesia (KTI) is indeed ongoing. However, it is strongly influenced by

the effectiveness of public spending and regional socioeconomic conditions. Social protection spending is the most effective fiscal instrument for accelerating HDI growth, while education and health spending do not yield significant results due to implementation problems and inefficiencies. On the other hand, poverty and unemployment remain the main obstacles in accelerating human development and slowing down the narrowing of inequality between provinces. This flow of results shows that the acceleration of the Convergence of the Human Development Index (HDI) in the Eastern Region of Indonesia (KTI) requires a more targeted fiscal policy as well as structural improvements in the quality of basic public services.

CONCLUSION

Inequality in human development between regions remains a crucial issue in the Eastern Region of Indonesia (KTI), as this region lags behind the Western Region of Indonesia (KBI), despite the national Human Development Index (HDI) showing an increasing trend. This study aims to analyze the influence of government spending and socioeconomic factors on the Human Development Index (HDI) and to test whether there is convergence in human development across provinces in KTI during the 2015–2023 period. To achieve this goal, this study uses a quantitative approach with a dynamic panel data model via the First Difference–Generalized Method of Moments (FD-GMM), which allows for consistent testing of β Convergence while accounting for the dynamics of the Human Development Index (HDI) and potential endogeneity.

The estimated results show that the convergence process β occurs in the Eastern Region of Indonesia, indicating that provinces with lower initial HDI levels tend to experience faster HDI growth than provinces with higher initial HDI levels. However, the rate of convergence is still relatively slow, so the gap in human development has not been fully closed. Education and health spending partially increase the Human Development Index (HDI), while

poverty and open unemployment negatively affect human development. These findings confirm that the effectiveness of public spending and improvements in socioeconomic conditions are key factors in accelerating the convergence of human development in disadvantaged areas.

The implications of this research include academic, policy, and social aspects. Academically, this research enriches the regional development literature by integrating a convergence analysis of human development and fiscal-socioeconomic factors within a dynamic panel framework in the context of the Eastern Region of Indonesia. In terms of policy, the study's results emphasize the importance of optimizing public spending, primarily by increasing the effectiveness of education, health, and social protection spending to improve the quality of human resources. Socially, the acceleration of the Convergence of the Human Development Index (HDI) in KTI is expected to reduce regional inequality, break the cycle of intergenerational poverty, and support the achievement of the Sustainable Development Goals (SDGs), especially goals 1, 3, 4, and 8.

This research has several limitations that need to be considered. First, the use of secondary data at the provincial level has not fully captured variations in human development at the district/city level. Second, the 2015–2023 observation period has not fully reflected the long-term impact of the post-COVID-19 pandemic on the dynamics of human development. Therefore, further research is recommended to use a longer time period, more detailed regional coverage, and to include institutional variables and the quality of fiscal governance in order to gain a more comprehensive understanding of the determinants and dynamics of human development convergence in Indonesia.

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