REGIONAL INNOVATION AND HUMAN DEVELOPMENT: THE MODERATING ROLE OF FISCAL CAPACITY IN INDONESIA

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Abstract

This study aims to analyze the effect of regional innovation on human development at the district/city level in West Java Province, with fiscal capacity as a moderating variable. Employing an explanatory quantitative approach, the study uses panel data from 2019 to 2023 across 27 local governments to test hypotheses through multiple linear regression analysis in SPSS. The findings indicate that regional innovation has a positive and statistically significant impact on the Human Development Index (HDI). Moreover, fiscal capacity significantly moderates the relationship between regional innovation and HDI, indicating that the effect of innovation on human development is more potent in regions with higher budgetary capacity. The significant influence of control variables further supports these results—Gross Regional Domestic Product (GRDP) per capita (positive) and poverty rate (negative)—on HDI. The practical implication of this study highlights the importance of synergy between policy innovation and fiscal strength in formulating human development strategies within the framework of regional autonomy. The study also contributes theoretically to the discourse on innovation governance and regional development, while offering a relatively novel fiscal moderation approach within the context of public policy studies in Indonesia.

Keywords: regional innovation, human development, fiscal capacity, GRDP, poverty rate

INTRODUCTION

Human development is a primary goal in the process of sustainable regional development (Rusydi et al., 2022; Herinoto et al., 2021). The quality of human development is generally measured using the Human Development Index (HDI), which encompasses three core dimensions: longevity and healthy life, knowledge, and a decent standard of living. HDI serves as a strategic indicator because it holistically represents development outcomes in the health, education, and economic sectors (Wididarma & Jember, 2021; Si'lang et al., 2019; Hakim et al., 2024).

At the national level, Indonesia's human development achievements have shown a consistent upward trend in recent years. According to data from Statistics Indonesia (BPS), the country's Human Development Index (HDI) increased to 74.39 in 2023, a rise of 0.62 points or 0.84 percent from the previous year's figure of 73.77 (BPS, 2023). This positive trend continued in 2024, with the HDI rising further to 75.02, reflecting a growth of 0.63 points (BPS, 2024). These figures indicate steady progress in human development at the national level, although various structural and social challenges remain. However, this national-level advancement does not fully reflect evenly distributed conditions across all regions of Indonesia. At the provincial level, including in West Java, disparities in human development persist among districts and cities. West Java recorded an HDI of 74.24 in 2023, an increase from 73.12 in the previous year (BPS West Java, 2024). Although this growth places the province in the "high" HDI classification, inter-regional inequality remains a critical issue.

Human development disparities in West Java are evident in the varying HDI scores across regions. For instance, major cities such as Bandung and Bekasi have surpassed an HDI score of 80. At the same time, several districts, including Cianjur, Majalengka, and Pangandaran, continue to lag, with scores ranging from 67 to 70, which is below the provincial average (BPS West Java, 2024). This indicates that human development outcomes are not evenly distributed across districts and cities in West Java, likely due to factors such as geographic characteristics, fiscal capacity, and the level of regional innovation in delivering public services. Such disparities underscore the need for more adaptive and responsive policy innovations from local governments, particularly in designing development programs that directly target improvements in quality of life. Local governments are expected not only to rely on conventional approaches but also to promote innovative breakthroughs that enhance the effectiveness and efficiency of public services, while addressing the persistent challenges of human development inequality (BPS Sumedang, 2024).

In addressing these disparities, innovative governance strategies are becoming increasingly relevant. Local governments are now expected to enhance the quality of life for their citizens through innovation-driven approaches across various public service sectors, including education, health, and the local economy (Haris et al., 2024; Sastra Wijaya, 2024; Lindawati & Khie, 2024). Regional innovation serves as a critical instrument for shaping policy responses that are more adaptive to local needs. The literature highlights that absorptive capacity—the ability of local institutions to absorb and effectively implement innovation—has a positive correlation with enhanced human development outcomes (Dialga & Ouoba, 2022; Siregar et al., 2024; Choi & Cho, 2023). These studies conclude that the impact of regional policy innovation on the Human Development Index (HDI) is more optimal when supported by adequate fiscal capacity and institutional strength.

In the context of fiscal decentralization, regional fiscal capacity—such as the ratio of locally generated revenue (Pendapatan Asli Daerah, PAD) to total regional revenue—plays a strategic role. Studies conducted in districts and cities across West Java indicate that low fiscal independence limits the ability of local governments to effectively allocate direct spending in key public sectors such as health and education (Temenggung et al., 2020; Rindayati et al., 2007; Wardhanu & Santosa, 2013). These studies consistently find that regions with low PAD are more dependent on intergovernmental transfers, which in turn constrain their local fiscal innovation. Several regional studies have also shown that fiscal decentralization significantly affects the Human Development Index (HDI); PAD and Special Allocation Funds (DAK) are found to have a positive effect on HDI, while Revenue Sharing Funds (DBH) exhibit a negative impact (Rusydi et al., 2022; Sofyan, 2023; Silalahi et al., 2023). Other studies note that regional capital expenditure has a positive influence on HDI, although PAD is not always statistically significant, and general fiscal transfers tend to have a partially adverse effect (Nashshar & Mulyana, 2022; Febriyanti & Dewi, 2024; Hobrouw et al., 2021). These findings suggest that innovation alone is insufficient; the structure of fiscal resources and the allocation of public spending also play a crucial role in determining human development outcomes.

This study offers a novel approach to understanding the relationship between regional innovation and human development, particularly within the context of district and city governments in West Java Province. While most of the previous literature has focused primarily on the role of innovation in improving bureaucratic performance or public service delivery in general, this study positions regional innovation as a strategic instrument to enhance the quality of life, as measured by the Human Development Index (HDI). This perspective aligns with the findings of Hilmawan et al. (2023), who emphasized the importance of regional innovation in strengthening social development outcomes. However, few studies have explicitly linked it to achievements in HDI. The key novelty of this research lies in the use of fiscal capacity as a moderating variable, a dimension that remains underexplored in Indonesian public policy literature. In prior studies, fiscal capacity has typically been viewed as a factor influencing regional spending or budgetary efficiency (Kirana & Saleh, 2011; Zein et al., 2024; Hairah et al., 2025). However, this study conceptualizes fiscal capacity as either an amplifier or a constraint on the effectiveness of regional innovation in producing tangible impacts on human development. Through this approach, the study contributes not only to the enrichment of fiscal governance theory but also to a deeper understanding of the synergy between local financial capacity and innovative policymaking.

The regional context of West Java further strengthens the relevance of this study. As the most densely populated province in Indonesia, with significant disparities in development levels across its districts and cities, West Java offers a complex and relevant empirical setting to examine the effectiveness of regional innovation. The persistent HDI disparities among districts and towns in the province indicate that the success of innovation is not solely determined by the quality of ideas or programs, but also by the fiscal capacity to support their implementation (BPS West Java, 2023). Therefore, a quantitative approach using secondary data from all districts and cities in the province enables a comprehensive analysis that can serve as a foundation for policymaking. Accordingly, this study contributes not only to the theoretical development in the fields of innovation governance and human development but also provides substantial practical implications for regional development planning based on fiscal capacity and innovation, with a focus on improving the quality of life.

This study also includes two control variables, namely Gross Regional Domestic Product (GRDP) per capita and the poverty rate. These variables are included to ensure that the relationship between regional innovation and the Human Development Index (HDI) is not predominantly influenced by macroeconomic factors that may directly affect quality of life. Controlling for these variables is essential to enhance the validity of the findings and to ensure that the causal relationship being tested truly reflects the effects of regional innovation and fiscal capacity. GRDP per capita serves as a key indicator of a region's level of economic prosperity (Surbakti et al., 2025; Pratiwi et al., 2025). Regions with higher GRDP typically possess stronger fiscal capacity, better infrastructure, and greater employment opportunities—all of which contribute to improvements in education, health, and living standards, the core dimensions of HDI. Therefore, without proper control, the influence of GRDP may overshadow or distort the actual effect of innovation on HDI (Pradana & Sumarsono, 2018; Syuhada et al., 2023; Ulah, 2025). By including GRDP as a control variable, this study aims to isolate the macroeconomic effects and more accurately capture the impact of innovation itself.

Meanwhile, the poverty rate also plays a crucial role in determining the quality of human development. Regions with high poverty levels tend to have lower educational and health achievements, as well as limited access to basic public services. Several studies have shown that a significant reduction in poverty levels is positively correlated with improvements in HDI at the regional level (e.g., Yusuf & Ramadhan, 2025; Alamsyah & Armelly, 2024; Rahmawati et al., 2024). Therefore, controlling for the poverty variable helps maintain the accuracy of the model in assessing the extent to which innovation contributes to human development, beyond the direct influence of a region's socioeconomic conditions. These two control variables also serve as essential complements that enrich the analytical framework of this study. By incorporating macroeconomic aspects such as GRDP and poverty rate, the relationship between innovation and HDI is not viewed linearly or simplistically, but rather within a broader structural context. This approach further strengthens the theoretical and practical contributions of the study, as it offers a more comprehensive perspective compared to previous research that often overlooks these macro-level control variables.

Based on this background, this study aims to analyze the impact of regional innovation on human development at the district and city levels in West Java Province, with fiscal capacity serving as a moderating variable. The study also accounts for the effects of Gross Regional Domestic Product (GRDP) and the poverty rate to achieve a more comprehensive understanding of the determinants of human development within the context of regional autonomy.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Literature Review

Endogenous Growth Theory

Endogenous Growth Theory serves as the primary theoretical foundation for explaining how investments in knowledge, innovation, and human capital can drive economic growth and development (Romer, 1986; Aghion & Howitt, 1992). In contrast to neoclassical growth theory, which treats technology as an exogenous factor, this theory posits that innovation is the result of internal decisions and policies made by a region or country. In this context, regional innovation refers to the capacity of local governments to design and implement policies and practices that enhance the quality of public services, foster local economic development, and facilitate adaptation to development challenges.

In the context of human development, regional innovation can generate new solutions in the areas of education, health, and welfare—three key pillars of the Human Development Index (HDI). Several studies have emphasized that regions with a high capacity for innovation tend to achieve better HDI outcomes (e.g., Li & Liu, 2021; Xholo et al., 2025; Cetinguc et al., 2023). Therefore, regional innovation serves as a vital instrument for accelerating inclusive and sustainable human development.

Resource-Based View (RBV)

The Resource-Based View (RBV) is also relevant in supporting the theoretical argument of this study. RBV emphasizes that an entity’s competitive advantage is primarily determined by its ability to leverage unique and inimitable internal resources, including fiscal capacity (Wernerfelt, 1984; Barney, 1991). Within this framework, fiscal capacity can be viewed as a strategic resource for local governments to support innovation and the implementation of human development policies. Regions with high fiscal capacity possess greater flexibility and fiscal space to design innovative policies that are responsive to community needs. Conversely, fiscal constraints may hinder the optimal use of innovation in improving HDI outcomes (Jin & Jakovljevic, 2023; Astriana & Khoirunurrofik, 2024; Nguyen et al., 2025; Sima et al., 2023).

Thus, Endogenous Growth Theory explains the importance of innovation as a driver of human development. At the same time, the Resource-Based View (RBV) provides a perspective on how fiscal capacity serves as a key element in optimizing the impact of such innovation.

Hypothesis Formulation

Innovation in regional governance is no longer seen as an option, but rather as a necessity in addressing the complexities of contemporary development challenges. Regional innovation encompasses the creation of new policies, programs, processes, and approaches that go beyond administrative functions to deliver transformative responses to social issues and public service delivery. In the context of local governments, innovation serves as a means to enhance bureaucratic effectiveness, accelerate service delivery, and strengthen connectivity between the government and the public (Latupeirissa et al., 2024; Afrilia et al., 2024; Suprianto, 2025). This innovative approach includes the adoption of digital technologies, evidence-based policy reformulation, and collaborative participation from non-governmental actors. Both technological innovations—such as e-government and public service applications—and non-technological innovations—such as procedural reforms and institutional design—are recognized as strategic instruments to respond to local challenges in an adaptive, efficient, and inclusive manner (Manar & Alfridaus, 2025; Suprianto, 2025; Latupeirissa et al., 2024).

Recent studies have shown that the planned and sustained implementation of public innovation can strengthen the quality of basic services such as education and health, two core components of the Human Development Index (HDI) (Suchitwarasan et al., 2024; Valackiene & Giedraitiene, 2024; Lubis et al., 2024; Hilmawan et al., 2023). In this regard, innovation has both direct and indirect effects on improving societal well-being. For example, the digitalization of health and education services can expand access and improve service quality, while innovative approaches to poverty alleviation can raise the standard of living (Xu et al., 2025; Gao et al., 2025; Djatmiko et al., 2025). Innovation based on local potential and needs also enables significant leaps in development by optimizing the use of available resources (Qian et al., 2024; Tajuddin & Mulang, 2024). Therefore, regional innovation stands as a key determinant of human development, particularly within the context of decentralization, which grants local governments broad autonomy.

H_1: Regional innovation has a significant effect on human development

Innovation in regional governance is no longer limited to technological aspects alone, but rather encompasses a wide range of policy dimensions, programs, and strategic approaches designed to address social issues and improve the quality of public services sustainably. Such innovations may take the form of more efficient administrative procedures, the use of digital technologies, collaborative mechanisms with communities, or structural reforms in public administration. Previous studies have shown that innovation in the public sector significantly contributes to improving the quality of basic services such as education, health, and social infrastructure, which ultimately leads to higher Human Development Index (HDI) outcomes (e.g., Latupeirissa et al., 2024; Valackiene & Giedraitiene, 2024; Figenschou et al., 2024). In addition, public innovation enables local governments to respond to the dynamic needs of society more adaptively and inclusively, while also strengthening public trust in government institutions (Djatmiko et al., 2025; Sipahutar et al., 2022; Aidi et al., 2024). Therefore, regional innovation—both technological and non-technological—serves as a vital instrument in enhancing human development performance, particularly within the context of regional autonomy, which requires fiscal and managerial independence. However, the effectiveness of regional innovation in influencing human development cannot be separated from the fiscal conditions of local governments.

Fiscal capacity, which reflects the extent to which local governments can mobilize and manage financial resources, is a critical prerequisite for ensuring the success and sustainability of innovative programs. Local governments with high fiscal capacity are more likely to initiate and expand various forms of service innovation, as they possess greater flexibility in budget allocation and are more responsive to community needs (Hu et al., 2024; Otoo & Danquah, 2021; Zhu et al., 2022). Conversely, limited fiscal capacity can become a structural barrier that prevents innovation from being implemented effectively, reducing it to short-term projects with minimal impact on public welfare (Haque et al., 2015; Setiawan et al., 2022). Therefore, fiscal capacity should be viewed not only as a supporting variable but also as a moderating factor in the relationship between innovation and social development outcomes, including improvements in the Human Development Index (HDI).

H_2: Fiscal capacity moderates the effect of regional innovation on human development

Gross Regional Domestic Product (GRDP) is used as one of the control variables in this study, as it represents the local economic strength of a region. As a macroeconomic indicator, GRDP reflects the capacity for producing and distributing goods and services within a given area. An increase in GRDP is often associated with rising household incomes, the creation of new employment opportunities, and growth in household consumption. Such conditions create a conducive environment for human development, as people gain better access to economic resources that support a decent standard of living (Ulya et al., 2025; Wang & Shao, 2022; G. Wang et al., 2023). Therefore, GRDP is essential to control for in the analysis, as it may directly or indirectly affect Human Development Index (HDI) outcomes.

Meanwhile, the poverty rate also serves as a crucial control variable in the context of human development. Poverty has a profound structural impact on people’s access to essential services, including education, healthcare, and adequate housing. Individuals or communities living in poverty often face disparities in quality of life and development opportunities, which in turn slow the progress of the Human Development Index (HDI) in the region. In many cases, regions with high poverty rates also struggle to provide inclusive and sustainable public services (Setiawan et al., 2022; Desdiani et al., 2022). Therefore, controlling for the poverty variable is essential to ensure that the influence of regional innovation on human development can be analyzed more objectively and accurately.

By accounting for these two control variables, this study aims to ensure that the relationship between regional innovation and human development is not distorted by macroeconomic conditions or structural aspects of community welfare. Controlling for GRDP and poverty rate also allows for the isolation of the specific effects of innovation and fiscal capacity on HDI, thereby producing more robust analytical results. This approach is also relevant in the context of public policy, where innovation and fiscal capacity must be promoted simultaneously, while carefully considering the local economic context and prevailing social challenges.

H_3: GRDP has a significant effect on human development

H_4: Poverty rate has a significant effect on human development

The research model is illustrated in Figure 1, which depicts the hypothesized relationships among regional innovation, human development, fiscal capacity, GRDP, and poverty rate, as discussed above.

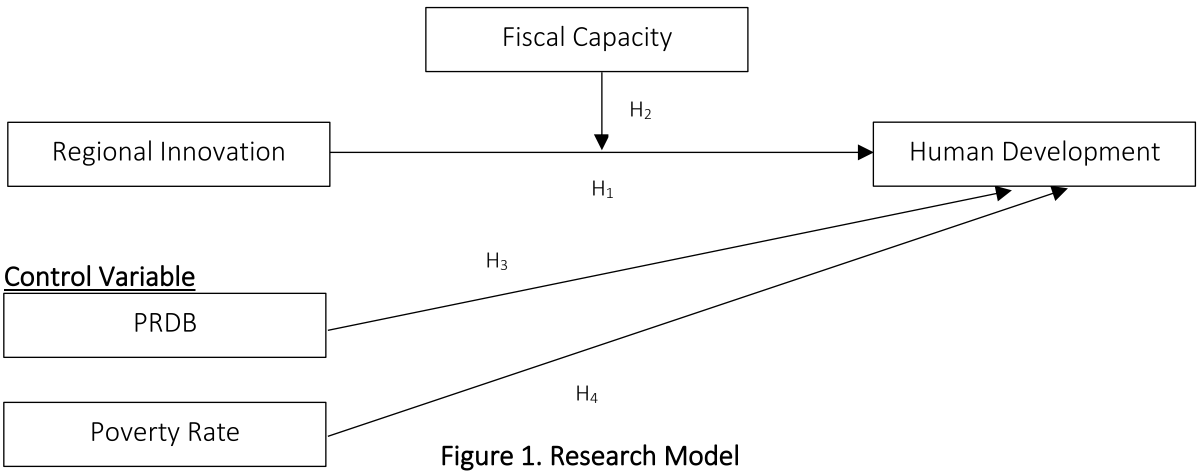

Figure 1. Research Model

RESEARCH METHODS

This study employs an explanatory quantitative approach, which aims to explain causal relationships between variables through hypothesis testing based on numerical data (Creswell & Guetterman, 2019). This approach was selected because it allows for systematic and objective testing of both direct effects and interaction effects (moderation) among regional innovation, human development, fiscal capacity, as well as the control variables—GRDP and poverty rate.

The population of this study comprises all local governments at the regency and city levels in West Java Province, totaling 27 regions, consisting of 18 regencies and nine cities. This population was selected because each local government plays a strategic role in promoting regional innovation and human development within its respective area. The study employs panel data, which combines cross-sectional (across regions) and time-series (across years) data. Data were collected from all regencies and cities in West Java Province over the period 2019 to 2023, resulting in a total of 135 observations. The 2019–2023 period was chosen based on the availability of complete and consistent data for all variables under study, including regional innovation, human development, fiscal capacity, and control variables such as GRDP and poverty rate. This timeframe also reflects the most recent and policy-relevant conditions for analysis. The sample in this study was determined using the census method, in which all members of the population were included as the sample. This approach provides a comprehensive overview of the influence of regional innovation on human development in West Java Province, enabling a more accurate analysis of interregional variations.

Table 1 provides information on variable definitions, measurement methods, year, and data sources.

Table 1. Variable Description and Data Sources

Variables	Definition	Measurement	Year	Data source
Regional Innovation *(Independent Variables)*	Regional innovation refers to the process of creating and implementing new ideas in local government policies, services, or governance practices to enhance the efficiency and effectiveness of public service delivery (Fatoni, 2022; Rahmanda, 2022).	Regional Innovation Index (RII)	2019-2023	Kementerian Dalam Negeri (Litbang Kemendagri)
Human Development *(Dependent Variable)*	Human development reflects the ability of individuals to live a healthy life, access education, and attain a decent standard of living (Nainggolan, 2021; Saksono, 2020).	Human Development Index (HDI)	2019-2023	Badan Pusat Statistik (BPS)
Fiscal Capacity *(Moderating Variables)*	Fiscal capacity refers to a region's ability to finance public services independently without relying on transfers from the central government (Hyman, 1996; Dame, 2021).	Regional Fiscal Capacity Ratio (RFCR)	2019-2023	Kementerian Keuangan – DJPK
GRDP *(Control Variables)*	GRDP per capita represents the average economic contribution per person and is used as an indicator of regional welfare (Mankiw, 2021).	Gross Regional Domestic Product (GRDP)	2019-2023	Badan Pusat Statistik (BPS)
Poverty Rate *(Control Variables)*	The poverty rate indicates the proportion of the population living below the poverty line and serves as an indicator of welfare inequality (Ravallion, 2016).	Poverty Rate (PR)	2019-2023	Badan Pusat Statistik (BPS)

This study employs a quantitative approach using panel data, which consists of both time-series and cross-sectional data. The analytical technique employed is multiple linear regression, conducted using SPSS Statistics version 26. SPSS was chosen for its efficiency in handling numerical data, performing classical assumption tests—such as normality, multicollinearity, heteroscedasticity, and autocorrelation—and presenting analytical results in a systematic and interpretable manner. The regression model in this study is designed to analyze the effect of regional innovation on human development, as well as to examine the role of fiscal capacity as a moderating variable. The moderating effect is tested using an interaction approach by constructing an interaction variable between regional innovation and fiscal capacity. Additionally, control variables—GRDP per capita and poverty rate—are included to ensure the model's validity. The analysis is conducted at a 5% significance level ($\alpha = 0.05$), with interpretation based on regression coefficients, significance values (p-values), and the coefficient of determination (R^2) to assess the strength and direction of relationships among variables.

This study examines the effect of regional innovation on human development with fiscal capacity as a moderating variable, and also tests the direct impact of control variables such as GRDP and poverty rate on human development. The following presents the structural model formulations for each of these relationships.

Model 1

Measures the extent to which the Regional Innovation Index (RII) and control variables such as Gross Regional Domestic Product (GRDP) and Poverty Rate (PR) affect the Human Development Index (HDI).

$$HDI_i = \alpha_1 + \beta_1.RII + \beta_2.GRDP + \beta_3.PR + \varepsilon_1$$

Model 2

Examines whether the Regional Fiscal Capacity Ratio (RFCR) moderates the effect of the Regional Innovation Index (RII) on the Human Development Index (HDI).

$$HDI_i = \alpha_2 + \beta_4.RII_i + \beta_5.RFCR_i + \beta_6.RII_i.RFCR_i + \beta_7.GRDP_i + \beta_8.PR_i + \varepsilon_2$$

RESULTS AND DISCUSSION

Result

Descriptive Statistic Analysis

Based on Table 2, the dataset used in this study comprises 135 observations spanning the years 2019 to 2023.

Table 2. Descriptive Statistics Result

Variable	N	Minimum	Maximum	Mean	Std. Deviation
HDI	135	67.45	82.31	73.86	3.57
RII	135	35.00	95.00	65.32	13.74
RFCR	135	0.18	0.92	0.47	0.18
GRDP	135	16,500	145,000	58,423	32,110
PR	135	4.10	14.25	8.71	2.41

Descriptive analysis in this study was conducted on five key variables: HDI, RII, RFCR, GRDP, and PR. The results show that the Human Development Index (HDI) of regencies/municipalities in West Java Province during the 2019–2023 period ranged from a minimum of 67.45 to a maximum of 82.31, with a mean value of 73.86 and a standard deviation of 3.57. This average indicates that most regions have reached the "high" classification in human development, although disparities between areas remain. Meanwhile, the Regional Innovation Index (RII) ranged from 35.00 to 95.00, with an average of 65.32 and a standard deviation of 13.74. This suggests that regional innovation capacity is at a moderate level, with considerable variation across regencies and municipalities.

The RFCR variable ranges from a minimum value of 0.18 to a maximum of 0.92, with a mean of 0.47 and a standard deviation of 0.18, indicating that regional fiscal independence remains relatively moderate and unevenly distributed across the regions. GRDP per capita reflects significant economic disparities across regions, with an average of IDR 58,423,000, a minimum of IDR 16,500,000, a maximum of IDR 145,000,000, and a standard deviation of IDR 32,110,000. Meanwhile, the Poverty Rate (PR) has an average of 8.71%, ranging from 4.10% to 14.25%, with a standard deviation of 2.41. These findings underscore that socio-economic and fiscal disparities persist as significant challenges to promoting equitable human development in West Java Province.

Classical Assumption Test

Before conducting the regression analysis, classical assumption tests were performed to ensure that the model meets the necessary statistical requirements, as presented in Table 3.

Table 3. Classical Assumption Test Result

Test Type	Testing Method	Results	Conclusion
Normality	Kolmogorov-Smirnov	Asymp. Sig. = 0,112 (> 0,05)	Fulfilled (Normal)
Multicollinearity	VIF & Tolerance	VIF of all variables < 10, Tolerance > 0.10	There is no multicollinearity
Heteroscedasticity	Uji Glejser	Sig. all variables > 0.05	There is no heteroscedasticity
Autocorrelation	Durbin-Watson	DW = 1.84 (close to 2)	No autocorrelation occurs

Before conducting the regression analysis, the data were first tested through a series of classical assumption tests to ensure that the multiple linear regression model meets the statistical requirements for validity and reliability. The normality test was performed using the Kolmogorov–Smirnov method and the P–P Plot graph, which indicated that the residuals were normally distributed (Asymp. Sig. > 0.05), thus satisfying the assumption of normality. Multicollinearity was tested by examining the Variance Inflation Factor (VIF) and Tolerance values for each independent variable. The results showed that all variables had VIF values below 10 and Tolerance values above 0.10, indicating no multicollinearity among the variables.

Furthermore, a heteroscedasticity test was conducted using the Glejser method, which revealed that all independent variables had significance values above 0.05, indicating the absence of heteroscedasticity in the model. The autocorrelation test was also performed using the Durbin–Watson test, which produced a DW value of 1.84—falling between the lower (dL) and upper (dU) bounds and approaching the value of 2—indicating no autocorrelation. Based on the results of these tests, it can be concluded that all classical assumptions were satisfied, thereby validating the regression model used in this study for further analysis and ensuring that its estimations can be interpreted reliably.

Hypothesis Testing

The following are the results of the multiple linear regression analysis for Model 1, which examines the effects of RII, GRDP, and PR on HDI, as presented in Table 4.

Table 4. Results of Multiple Linear Regression Analysis (Model 1)

Independent Variables	Beta Coefficient (B)	Std. Error	t-Statistic	Sig. (p-value)
Constant	55.213	3.218	17.16	0.000
RII	0.267	0.084	3.18	0.002**
GRDP	0.0041	0.0016	2.56	0.012*
PR	-0.452	0.128	-3.53	0.001**

$R^2 = 0.512$ Adjusted $R^2 = 0.498$ $F = 36.98$ ($p < 0.001$)

The results of the multiple linear regression analysis for Model 1 indicate that RII, GRDP per capita, and PR simultaneously have a significant effect on HDI. The adjusted coefficient of determination (Adjusted R^2) is 0.498, indicating that approximately 49.8% of the variation in HDI can be explained by the three variables in the model. The RII variable has a positive and significant effect on HDI, with a coefficient value of 0.267 and a p-value of 0.002, indicating that higher levels of regional innovation are associated with higher levels of human development.

Furthermore, the GRDP per capita variable also shows a positive and significant effect on HDI, with a coefficient value of 0.0041 and a significance level of p = 0.012. This indicates that regions with stronger economic capacity tend to have better quality of life. Conversely, the PR variable has a negative and statistically significant effect on HDI, with a coefficient of –0.452 and a p-value of 0.001, indicating that higher poverty rates are associated with lower levels of human development. Overall, these results confirm that regional innovation and economic conditions play a critical role in determining the quality of human development at the local level.

The following presents the results of the regression analysis for Model 2, which examines the role of the Regional Fiscal Capacity Ratio (RFCR) as a moderating variable in the relationship between the Regional Innovation Index (RII) and the Human Development Index (HDI), as shown in Table 5.

Table 5. Moderation Analysis Results (Model 2)

Variables	Beta Coefficient (B)	Std. Error	t-Statistic	Sig. (p-value)
Constant	53.681	3.544	15.14	0.000
RII	0.183	0.091	2.01	0.047*
RFCR	0.378	0.145	2.61	0.010*
RII*RFCR (Interaction)	0.119	0.042	2.83	0.006**
GRDP	0.0038	0.0015	2.53	0.013*
PR	-0.401	0.124	-3.23	0.002**

$R^2 = 0.587$ Adjusted $R^2 = 0.571$ $F = 38.42$ ($p < 0.001$)

The regression analysis results for Model 2 indicate that the Regional Fiscal Capacity Ratio (RFCR) functions as a significant moderating variable in the relationship between the Regional Innovation Index (RII) and the Human Development Index (HDI). This is evidenced by the interaction term (RII*RFCR), which has a positive coefficient of 0.119 and a significance value of p = 0.006. These findings suggest that fiscal capacity strengthens the positive impact of innovation on human development. In other words, the higher a region's fiscal capacity, the stronger the influence of innovation on human development outcomes.

In addition, the Regional Innovation Index (RII) continues to have a positive and significant effect on the Human Development Index (HDI) (coefficient = 0.183; p = 0.047), and the Regional Fiscal Capacity Ratio (RFCR) also shows a significant direct effect on HDI (coefficient = 0.378; p = 0.010). The control variables, GRDP per capita and Poverty Rate (PR), also consistently demonstrate significant effects—GRDP positively (p = 0.013) and PR negatively (p = 0.002). This model yields an Adjusted R^2 value of 0.571, indicating that approximately 57.1% of the variation in HDI can be explained by the combination of RII, RFCR, their interaction term, and the control variables. These findings reinforce the notion that the region's fiscal capacity significantly impacts the effectiveness of regional innovation in driving human development.

Discussion

The findings of this study provide empirical support for the notion that regional innovation plays a significant role in enhancing the Human Development Index (HDI). Innovation in this context is not limited to technological breakthroughs, but also encompasses institutional reforms, public service delivery, and policy designs that are adaptable to local needs. Within the framework of Endogenous Growth Theory, innovation acts as a driver of development originating from within the regional governance system itself. These findings emphasize that human development is not solely dependent on macroeconomic factors, but also on the creativity and capacity of local governments to generate contextual and innovative policy solutions. This aligns with previous studies that suggest regions consistently fostering local innovation systems tend to achieve higher levels of human development compared to those with stagnant institutional progress (e.g., Hilmawan et al., 2023; Setiawan et al., 2022; Sultoni et al., 2022).

Beyond merely establishing a direct relationship, this study also highlights the critical role of fiscal capacity as a key factor in enhancing the impact of innovation on human development. High fiscal capacity allows local governments to sustainably finance innovation implementation, particularly in education, health, and social welfare sectors. Within the Resource-Based View (RBV) framework, fiscal capacity is regarded as a strategic internal resource that provides a competitive advantage in executing innovative and impactful governance functions. These findings align with those of Desdiani et al. (2022) and Pandoyo (2024), which suggest that the success of local policy innovation is highly dependent on a region's fiscal strength. In other words, without sufficient fiscal capacity, innovation is likely to remain at the idea stage without being realized in concrete terms in public service delivery.

In the realm of public policy, these findings broaden the understanding that regional innovation is not a standalone entity, but rather the outcome of interactions among fiscal capacity, institutional structure, and responses to social dynamics. This study contributes to the literature by demonstrating that fiscal capacity not only directly influences development outcomes but also acts as a moderating variable that enhances the effectiveness of innovation. This aligns with evolving theoretical approaches in governance innovation, which emphasize that local budgets, expenditure efficiency, and fiscal allocation are critical determinants of the sustainability of innovative policies. In the context of regional autonomy in Indonesia, the results affirm that human development strategies must be designed in an integrated manner, taking into account the synergy between innovation and the fiscal structures that support it.

This study also enriches the empirical literature by affirming the consistency of its findings with various previous studies. For instance, Setiadi et al. (2025) and Yasin et al. (2021) noted that public sector innovation supported by strong fiscal systems tends to produce greater developmental impacts. Similar conclusions are found in studies that emphasize the positive correlation between local fiscal strength and the effectiveness of human development policies (TÜMAY, 2021; Jin & Jakovljevic, 2023; Astriana & Khoirunurrofik, 2024). Similarly, studies by Canavire-Bacarreza et al. (2020) and Sima et al. (2023) have demonstrated a positive correlation between regional fiscal strength and development outcomes. This study complements those findings by introducing a moderation framework and testing it quantitatively, thereby offering both methodological and substantive contributions to the discourse on innovation-driven and fiscally grounded development.

Overall, the findings of this study reinforce the argument that efforts to improve the quality of human development at the regional level cannot rely solely on promoting innovation, but must also be accompanied by the strengthening of fiscal capacity. Therefore, the synergy between innovation and fiscal strength should serve as the foundation for designing regional development strategies. This approach is not only relevant for West Java Province but can also be replicated in other regions with adjustments to their respective institutional and social contexts. In the long term, strengthening public innovation systems that are responsive to regional fiscal capacity is key to achieving inclusive and sustainable governance.

CONCLUSION

This study concludes that regional innovation has a positive and significant effect on human development at the district/city level in West Java Province. The higher the level of innovation carried out by local governments, the higher their achievements in the Human Development Index (HDI). Additionally, fiscal capacity serves as a moderating variable that enhances the effect of innovation on HDI. These findings suggest that innovation, when not supported by sufficient fiscal capacity, tends to be less effective in improving the quality of life. Control variables, such as GRDP per capita and poverty rate, are also proven to influence HDI significantly.

The practical implication of this study’s findings is the importance for local governments to strengthen their fiscal capacity through the optimization of locally generated revenue (PAD), efficient budget allocation, and the reform of regional financial management digitally and transparently. Public policy innovation will have a greater impact when accompanied by an adequate fiscal structure. Therefore, strategies to improve human development based on innovation must be carried out simultaneously with fiscal strengthening. Synergy among local governments, the private sector, academia, and the community (quadruple helix) must also be reinforced to create an inclusive and sustainable regional innovation ecosystem.

This study is limited by its geographic scope, which only involves one province, and by its quantitative approach that does not capture the qualitative dynamics of innovation implementation. Therefore, future research is recommended to expand the geographic coverage across multiple provinces and to adopt a mixed-methods approach to gain deeper insights into the contextual processes and impacts of innovation. Future studies could also focus their analysis on specific public service sectors or compare the effectiveness of innovation in regions with varying fiscal structures, thereby enriching the understanding of the synergy between innovation and fiscal capacity in advancing human development.

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