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Discovering Poverty and Its Influencing Factors in the Capital City of Nusantara (IKN)

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Abstract

This paper explores the causality between per capita expenditure (PCE), unemployment (Umt), and labour supply (LS) on poverty (Pvt) through health quality (HQ) in the IKN region during 2016–2024. The rationale for this research is that the IKN project has the potential to rapidly transform the labour market and economic structure, meaning that the impact of economic growth on poverty is influenced not only by the scale of economic activity itself but also by the population's health capacity to respond to economic pressures and opportunities. Furthermore, health quality plays a crucial role in enhancing or diminishing the effectiveness of expenditure and employment opportunities in reducing poverty; therefore, neglecting this element risks producing IKN development policies that are neither inclusive nor sustainable. The Ordinary Least Squares (OLS) method was employed to analyse secondary panel data, which was adapted into a multiple regression and moderation model, yielding three key findings. First, PCE and Umt have a significant effect on HQ. Second, Umt, LS, and HQ significantly influence Pvt. Third, PCE and Umt, moderated by HQ, are shown to have a significant effect on Pvt. Among the variables examined, only Umt consistently plays a significant role in extending HQ or reducing Pvt.
Keywords: Poverty, Health Quality, OLS, Multiple Regression and Moderation

Abstrak

Makalah ini dibuat untuk memeriksa kausalitas antara pengeluaran per kapita (PCE), pengangguran (Umt), dan penawaran tenaga kerja (LS) terhadap kemiskinan (Pvt) melalui kualitas kesehatan (HQ) pada lingkup IKN selama 2016–2024. Alasan logis yang menjadi baseline penelitian karena proyek IKN berpotensi mengubah pasar tenaga kerja dan

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struktur ekonomi secara cepat, sehingga dampak pertumbuhan ekonomi terhadap kemiskinan tidak hanya ditentukan oleh besaran aktivitas ekonomi itu sendiri, melainkan juga oleh kapasitas kesehatan penduduk dalam merespons tekanan ekonomi dan tantangan. Selain itu, kualitas kesehatan berperan krusial dalam memperkuat atau melemahkan efektivitas pengeluaran dan kesempatan kerja dalam menurunkan kemiskinan, sehingga mengabaikan elemen ini berisiko menghasilkan kebijakan pembangunan IKN yang tidak inklusif dan kurang berkelanjutan. Metode Ordinary Least Squares (OLS) sebagai alat pengujian data panel berjenis sekunder yang dimodifikasi kedalam model regresi berganda dan moderasi dengan tiga temuan kunci berikut. Pertama, PCE dan Umt berpengaruh signifikan terhadap HQ. Kedua, Umt, LS, dan HQ berpengaruh signifikan terhadap Pvt. Ketiga, PCE dan Umt yang dimoderasi oleh HQ terbukti berpengaruh signifikan terhadap Pvt. Diantara variabel yang ada, hanya Umt yang secara konsisten mampu berperan dalam memperpanjang HQ ataupun memperkecil Pvt secara signifikan.
Kata Kunci: Kemiskinan, Kualitas Kesehatan, OLS, Regresi Berganda dan Moderasi

INTRODUCTION

The relocation of Indonesia's administrative capital from Jakarta to East Kalimantan Province, designated as the IKN, is motivated by economic considerations rooted in the principles of equitable national development and the reduction of spatial disparities between regions (Kuleh et al., 2025). Geographically, the development of IKN aims to diminish the economic dominance of Java—especially Jakarta, which contributes the largest share to the national Gross Domestic Product (GDP)—by establishing intensive and balanced new economic growth centres outside Java. This strategy is intended to stimulate investment and industry in eastern Indonesia while generating employment through the acceleration of national economic diversification (Darma et al., 2025; Junaidi et al., 2025). Hadiningrat (2024) reveals that the relocation of the IKN is expected to provide a positive stimulus for economic growth in East Kalimantan Province by strengthening economic transformation, creating new job opportunities, and boosting regional output, which has previously lagged behind that of Java.

Economically, the rationale for the relocation also encompasses broader economic development through the spillover effects of large-scale investment in IKN infrastructure. This investment is expected to stimulate the small and medium-sized enterprise (SME) sector and expand the local production and industrial base, in addition to creating a new administrative centre capable of absorbing local labour (Althalets et al., 2025). This is essential because economic concentration in Jakarta and its surrounding areas has resulted in pressure from high living costs, strained infrastructure, and pronounced income disparities between regions, which in turn limit opportunities for inclusive growth outside Java. Therefore, the relocation of the IKN is also advantageous for shifting the development pattern from Java-centric to Indonesia-centric, providing production and consumption benefits and, at the very least, reducing dependence on old, densely populated metropolitan areas.

As is well known, the IKN is not merely the physical location of the new national capital but also a special governmental entity with its own authority, distinct from the concept of autonomous provincial, municipal, or district governments elsewhere in Indonesia. According to Satria (2023) and Tenritatta et al. (2025), the IKN was established through Law Number 3 of 2022 concerning the 'National Capital,' which provides the legal basis for the formation of the IKN Authority as a non-ministerial government agency reporting directly to the President. It holds fundamental authority over planning, development, management of licensing and

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permits, and spatial planning, without interference from local legislative councils, as is typical in conventional autonomous governments. Thus, the IKN has an asymmetrical governance structure that separates the administrative affairs of the capital city from the regency government structures, such as Penajam Paser Utara (PPU) and Kutai Kartanegara (Kukar), offering flexibility in governance centred on the administration of the IKN.

In addition to PPU and Kukar, the city of Balikpapan is also located nearby and possesses complementary strategic links within the framework of IKN regional development. Serving as buffer zones for IKN, all three areas have distinct capacities (Jauchar et al., 2022; Jiuhardi et al., 2023; Putri et al., 2024). Firstly, Balikpapan acts as the main economic, industrial, and logistics centre in eastern Indonesia, boasting robust land infrastructure, airports, and ports capable of supporting the connectivity of goods and materials to and from the IKN, as well as the supply of labour. This facilitates accelerated business activities and investment flows in the areas surrounding the IKN, thereby strengthening Balikpapan's position as a source of financing for development activities and a distribution gateway for the IKN. Secondly, PPU, which directly borders the core of the IKN area, has experienced a dramatic surge in economic growth due to the influx of substantial investment capital, increased production in the service sector, and construction activities. This growth has created opportunities for local labour absorption and established PPU as a supporting settlement point for the IKN. Thirdly, with its natural resource-based economic prospects, particularly in the agriculture and fisheries sectors, Kukar serves as a base for food security development and can supply the food needs of the IKN area, thereby supporting regional economic sustainability. Essentially, the academic studies cited above conclude that economic development in the IKN buffer zone can stimulate local economic growth and reduce regional disparities.

The primary controversy surrounding the IKN, particularly regarding its socio-economic dynamics such as poverty, is seldom emphasised in many publications. This is illustrated by Rachmawati et al. (2025), who note that although the IKN is intended as a strategic project to accelerate equitable development and national economic growth, its complex socio-economic impacts—including the vulnerability of certain community groups and the risk of economic inequality affecting local communities and migrant workers—have not been thoroughly discussed. Consequently, dimensions such as economic inclusion and local structural poverty often receive insufficient national and international attention. While there was initially social cohesion between migrants and local communities, policies remain necessary to address challenges related to social perception and security amid the major transition prompted by the IKN project. This also reflects that socio-economic impacts, including access to economic resources, distribution of employment opportunities, and patterns of labour migration, require further investigation to prevent the emergence of inequalities that could provoke new controversies, specifically the marginalisation of vulnerable groups within the IKN and its surrounding areas.

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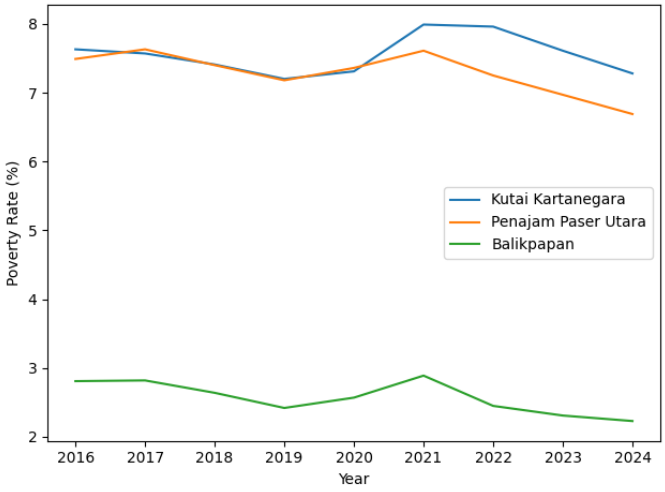

Figure 1. Trend Graph in the IKN, 2016–2024

Source: BPS-Statistics Kalimantan Timur Province (2025a) processed via Python.

Currently, the average poverty rate in the IKN over the past nine periods stands at 5.8%. Based on this figure, the regions of Kukar, PPU, and Balikpapan, which represent the IKN, demonstrate that poverty there is classified as moderate. A more detailed examination of these three regions reveals that Kukar has the highest average poverty rate, at 7.55%. Besides, Figure 1 shows that the average poverty rate in PPU is also close to that of Kukar, at 7.29%. In other words, poverty levels in both Kukar and PPU are classified as high. By contrast, only Balikpapan has an average poverty rate below that of the IKN overall, at 2.57%, which is classified as low.

Polemics surrounding poverty in the IKN remain a complex subject of debate among scholars, particularly within the disciplines of economics, health, and social sciences. Moreover, focusing attention on poverty and the aspects that shape it is a pertinent topic for in-depth analysis. The originality of this paper lies in addressing gaps in the existing literature by offering several key advantages. Firstly, the paper concentrates on the IKN by elaborating three regions—namely Kukar, PPU, and Balikpapan—which are the areas closest to the IKN. Due to their highly strategic geographical locations, these three regions undoubtedly play a vital role in determining the sustainability of the IKN itself. Secondly, this paper is structured around five indicators for assessing the success of multidimensional development: population expenditure, unemployment, employment, poverty, and health levels, integrated into a coherent quantitative approach commonly practised in regional development studies. Thirdly, it modifies the OLS method into two techniques—multiple regression and moderation regression—to project causality among various development components over a medium-term observation period.

Several papers have examined the relationship between economic variables such as per capita expenditure, unemployment, labour market conditions, and poverty. Nonetheless, some of these studies still treat these variables in isolation, without considering the role of health as a mechanism capable of addressing the dynamics of poverty. From a development economics perspective, health is not merely an indicator of social well-being but also a productivity measure that determines households' ability to access employment opportunities, maintain income, and escape the poverty trap (Bloom & Canning, 2008; Wagstaff, 2007; Strauss & Thomas, 2008). Unfortunately, the contemporary literature examining the relationship between unemployment, per capita expenditure, poverty, and labour supply—incorporating health status as a moderating variable—remains relatively limited, particularly in regions undergoing rapid economic transformation, such as the IKN

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buffer zone. To date, most studies have focused on infrastructure development, regional economic prospects, or institutional aspects. Meanwhile, the socio-economic dynamics of local communities—including the causal relationships between economic and health variables in shaping poverty levels—have yet to be extensively explored through quantitative analysis.

Objectives and Benefits

The motivation behind this paper is structured around three objectives. First, to calculate the relationship between per capita expenditure, unemployment, and labour supply on health quality. Second, to investigate the impact of per capita expenditure, unemployment, labour supply, and health quality on poverty. Third, to explore the urgency of health quality in mediating the relationship between per capita expenditure, unemployment, and labour supply on poverty. The output of this paper are expected to contribute to the advancement of modern literature and to assist regulators and stakeholders in informed decision-making.

Framework and Hypothesis

Referring to several scientific works, per capita expenditure is used as a measure of regional economic performance and capacity, while unemployment reflects current labour market conditions, and labour absorption implies the extent of employment opportunities generated by economic activity (Amar et al., 2022; Nahor & Anggraini, 2025). Labour absorption also denotes the ability of an economy or a specific business sector to integrate the workforce into actual employment (Habanabakize et al., 2019). Poverty is selected as the primary outcome of development because it describes the true economic welfare of the community (Segoro & Wahed, 2025). These three factors are direct determinants of poverty in development theory. Additionally, health quality reflects individual life expectancy, which is closely linked to labour productivity, influences households' capacity to cope with economic pressures (e.g., unemployment), and strengthens economic effectiveness, such as purchasing power and employment opportunities, in the fight against poverty (Azhari et al., 2025). On the other hand, high unemployment rates can undermine health outcomes by increasing psychological stress and reducing household income stability. This situation further elevates the risk of physical and mental health problems and limits access to healthcare services (Cylus & Avendano, 2017).

From the perspective of modern development economics, the relationship between household economic circumstances, poverty, and health is elucidated through a multidimensional development model that positions health as a part of human capital. Typically, an increase in per capita expenditure reflects a household's economic capacity to meet basic needs such as sanitation, access to healthcare, and nutrition, which ultimately drives the quality of public health. Here, health is regarded not only as an indicator of economic development success but also as a productivity factor influencing an individual's ability to participate in economic activities. Recent research indicates that superior health outcomes are closely correlated with individual income and labour productivity, thereby reinforcing societal prosperity (Pinna Pintor et al., 2024). Yusuf and Setiawan (2022) argue that population health indicators have a causal relationship with income growth and economic performance, as a healthy population is capable of maintaining more stable economic capacity and working more productively. Within the framework of regional development, an increase in per capita expenditure and positive trends in the labour market can strengthen the quality of public health, ultimately stimulating welfare levels while reducing poverty itself.

In addition to household consumption, labour market dynamics play a crucial role in explaining the relationship between poverty and economic conditions. A sharp rise in

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unemployment can drastically reduce household income stability while increasing economic vulnerability, ultimately limiting people's ability to access basic needs, including healthcare. Conversely, an increase in labour force participation reflects an economy's capacity to absorb the workforce, thereby improving household welfare and broadly expanding income opportunities. Taresh et al. (2025) argue that better public health can boost labour productivity and income, which in turn can drive economic growth, the distribution of social welfare, and the labour market progressively. Health quality serves not only as an indicator of social welfare but also as a bridge that can either weaken or strengthen the influence of economic variables on poverty. In this context, per capita expenditure, unemployment, and labour force participation are viewed as economic components influencing health quality and poverty, while health quality can act as a catalyst that moderates the relationship between economic variables and poverty levels within a region.

The conceptual framework was developed by calibrating the concept of holistic development, focusing on economic, social, and health dimensions within the IKN as a newly defined area. Substantively, this study primarily examines life expectancy (HQ) as a measure to translate economic and social performance into overall prosperity. In this context, per capita expenditure (PCE), unemployment (Umt), and labour supply (LS) are determinants of HQ. In addition, PCE, Umt, LS, and LS are linked to Pvt. Finally, HQ acts as an intermediary in the linkages between PCE, Umt, LS, and Pvt. Figure 2 visualises the conceptual framework of the research. For clarity, the golden yellow rectangles represent independent variables, the light blue rectangles denote moderating variables, and the pastel green rectangles indicate dependent variables.

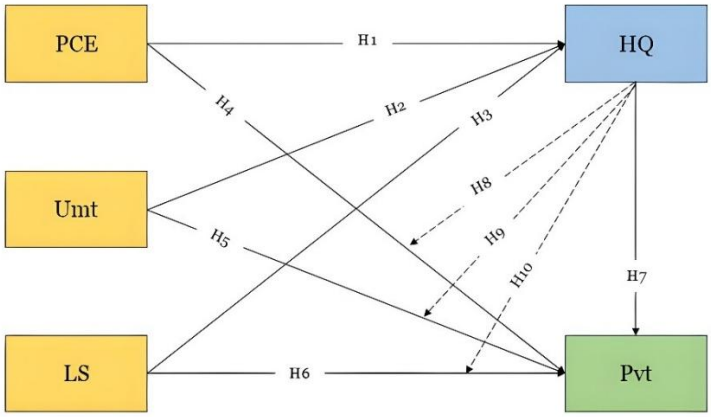

Figure 2. Framework with Hypothesis Scenario

Source: Created by the authors.

Referring to the supporting synthesis, foundational literature, and current realities, several alternative hypotheses are proposed as follows:

H1: PCE can extend HQ.

H2: Umt can reduce HQ.

H3: LS can extend HQ.

H4: PCE contributes negatively to Pvt.

H5: Umt contributes negatively to Pvt.

H6: LS contributes negatively to Pvt.

H7: HQ contributes negatively to Pvt.

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H8: HQ amplifies the impact of PCE on Pvt.

H9: HQ weakens the impact of Umt on Pvt.

H10: HQ mitigates the impact of Pvt through LS

METHODOLOGY

A quantitative approach was adopted to answer and fulfil the research objectives through a series of hypothesis tests. The data material comprised secondary sources obtained from a third party, specifically official government agencies. These data represent the government's short-term development targets and performance indicators, selected according to the research requirements with the following specifications: (1) per capita expenditure, (2) unemployment, (3) labour supply, (4) health quality, and (5) poverty. The data were collected in three stages: information access, documentation, and recapitulation via the internet. The dataset spans the years 2016–2024 and covers three regions within the IKN: Kukar, PPU, and Balikpapan. The secondary data were curated and processed into panel data. To facilitate presentation, the data were processed using SPSS and Python software. The research operational data and their complete sources are detailed in Table 1.

Given that the data used in this study are panel data covering a temporal dimension (2016–2024) and a spatial dimension (Kukar, PPU, and Balikpapan), the empirical analysis primarily employs a panel regression approach. However, in this study, the estimation was conducted using an OLS model adapted to estimate relationships between variables through multiple regression and moderation. This approach remains valid for analysing relationships between variables, provided that the classical assumptions are satisfied (Baltagi, 2021; Wooldridge, 2020).

Table 1.
Variable Size

Variables name (abbreviation)	Parameter	Characteristics of variables
Poverty (Pvt)	Percentage of the population living in poverty as of March each year	Dependent
Health quality (HQ)	Life expectancy of the population, in years	Moderation
Per capita expenditure (PCE)	Average monthly per capita expenditure on food and non-food items in rural and urban areas, expressed in Indonesian rupiah (IDR)	Independent
Unemployment (Umt)	Open unemployment rate as of August in a given year, per cent	Independent
Labour supply (LS)	Labour force participation rate as of August in a given year, per cent	Independent

Source: BPS-Statistics Kalimantan Timur Province (2025a,b,c,d,e).

The OLS method is elaborated into two econometric models, namely multiple regression and moderation regression, to estimate direct and indirect effects. These two analytical instruments are applied in the following four phases. First, descriptive statistics are used to examine the variation in the variable data. Second, correlation tests (r) and model summaries are conducted to assess the strength and suitability of the regression. Third, classical assumption tests are performed to ensure that the regression estimates are valid and that

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the data are normally distributed. Fourth, hypothesis testing is carried out to evaluate the model both partially and simultaneously.

The basic equation within the overall relational model is formulated as follows:

$$HQ = f_1(PCE, Umt, LS) \quad \textbf{(1)}$$

$$Pvt = f_2(PCE, Umt, LS, HQ) \quad \textbf{(2)}$$

Based on the hypothetical design, the correlation paths in multiple regression are formulated as the following two equations:

$$\ln(HQ_{it}) = \beta_0 + \beta_1 \ln(PCE_{it}) + \beta_2 Umt_{it} + \beta_3 \ln(LS_{it}) + \varepsilon_{1it} \quad \textbf{(3)}$$

$$Pvt_{it} = \beta_0 + \beta_4 \ln(PCE_{it}) + \beta_5 Umt_{it} + \beta_6 \ln(LS_{it}) + \beta_7 \ln(HQ_{it}) + \varepsilon_{2it} \quad \textbf{(4)}$$

The specification of the linkages for the interaction relationship using moderated regression is written as follows:

$$\ln Pvt_{it} = \beta_0 + \beta_1 \ln(PCE_{it}) + \beta_2 Umt_{it} + \beta_3 \ln(LS_{it}) + \beta_7 \ln(HQ_{it}) + \beta_8 [\ln(PCE_{it}) \text{ x } \ln(HQ_{it})] + \beta_9 [Umt_{it} \text{ x } \ln(HQ_{it})] + \beta_{10} [\ln(LS_{it}) \text{ x } \ln(HQ_{it})] + \varepsilon_{3it} \quad \textbf{(5)}$$

Symbol notation;

f_1 and f_2	= functions of the first and second equations
β_0	= constant term
β_1–β_7	= coefficients for direct relationships
β_8–β_{10}	= coefficients for indirect relationships
ln	= logarithm
it	= unit cross-section at a given time
x	= interaction effect
ε_1–ε_3	= residuals or errors in all models

DISCUSSION AND FINDINGS

Descriptive Statistics

The descriptive statistics in this study exhibit varied scores, as some variables have different units of measurement, some of which are notable. Three variables (Pvt, Umt, and LS) share the same unit, which is percentage. The unit for variables such as HQ is years, while for PCE it is Rupiah (IDR). Table 2 below presents the descriptive statistics for all variables.

Table 2.
Descriptive Statistical Results

Variables	Range	Mean	SD	Skewness	Kurtosis
Per capita expenditure (PCE)	1,462,287	1,566,465.08	419,815.63	0.728	–0.532
Unemployment (Umt)	8.34	5.65	2.17	0.256	–0.95
Labour supply (LS)	12.1	65.06	2.63	1.021	2.033
Health quality (HQ)	4.3	72.74	1.39	0.39	–1.295
Poverty (Pvt)	5.76	5.8	2.35	–0.72	–1.527

Source: Data tabulated via SPSS.

The values of each item in the descriptive statistics are listed in descending order. Firstly, the highest range score was for PCE, reaching IDR 1,462,287, while the lowest was for HQ, at 4.3 years. Secondly, the highest mean score was for PCE, amounting to IDR 1,566,465.08, whereas Umt was the variable with the lowest mean, at 5.65%. Thirdly, the highest standard

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deviation (SD) was observed in PCE at IDR 419,815.63, and the lowest in HQ at 1.39 years. Fourthly, the highest skewness score was for LS at 1.021, while Pvt had the lowest at –0.72. Fifthly, the highest kurtosis score was for the LS variable, reaching 2.033, and the lowest for Pvs, at –1.527. Table 2 also confirms that there are marked differences between the range, mean, SD, and skewness scores and the kurtosis scores, with the latter predominantly negative.

Correlation Test and Model Summary

A correlation test (*r*) is used to identify the strength and direction of the relationship between two variables, indicating whether it is negative, positive, or unrelated. Technically, this test also helps detect initial correlations between variables before further analysis is conducted. Five brief standards in *r* testing correspond to the following values: (1) $r > 0$ = unidirectional relationship, (2) $r < 0$ = inverse relationship, (3) $|r| < 0.3$ = weak, (4) 0.3–0.6 = moderate, and (5) > 0.6 = strong. Figure 3 shows the correlation output based on SPSS combined with Python to display a coloured heatmap. The numbers in the cells represent the Pearson correlation coefficient values. The five colour gradations on the heatmap and their guidelines are as follows: (1) dark blue (close to −1) = very strong negative relationship, (2) light blue = weak to moderate negative relationship, (3) white/grey = very weak or no relationship, (4) pink–orange = moderate positive relationship, and (5) dark red (close to +1) = very strong positive relationship. The heatmap, featuring dark blue colours, indicates a strong to very strong negative relationship. This is evidenced by the correlations between PCE and Pvt (−0.837), Umt and Pvt (−0.709), and HQ and Pvt (−0.905). The orange–pink colour represents a moderate positive relationship, signifying a moderate correlation between PCE and Umt (0.513) and between Umt and HQ (0.619). The dark red colour for PCE and HQ (0.921) reflects a very strong positive relationship. Finally, the grey–light blue colour, corresponding to a value range of $|r| < 0.10$–0.35 in LS with other variables articulates a weak or insignificant correlation.

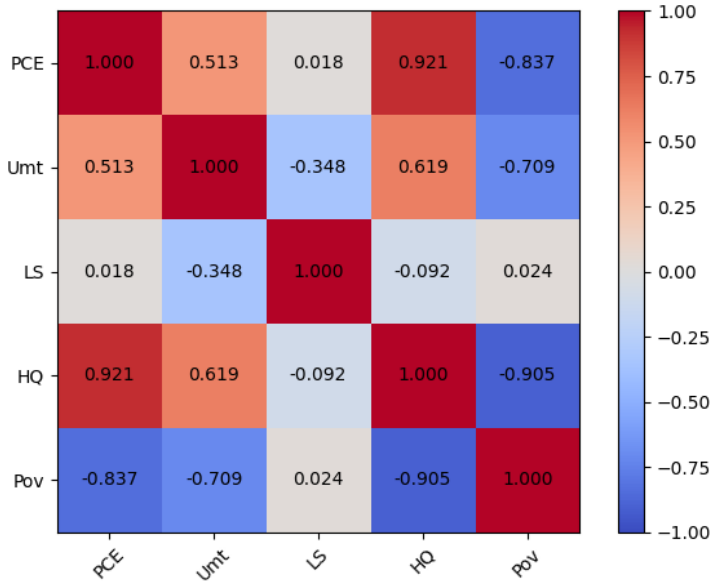

Figure 3. Heatmap of Variable Interrelationships

Source: Data was tabulated using SPSS and Python.

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For further information, the heatmap illustrates the strength and direction of the correlations between the research variables. Dark blue indicates a strong negative relationship, while light blue denotes a weak to moderate negative relationship. Grey signifies an insignificant or very weak relationship. Then, colours ranging from orange to red indicate positive relationships of increasing strength. The values in each cell represent the Pearson correlation coefficient between two variables. The visualisation results show strong negative relationships between PCE and Pvt, Umt and Pvt, and HQ and Pvt, while a strong positive relationship is observed between PCE and HQ.

According to this study, the model summary test is intended to assess the collective performance of regression models, particularly through metrics such as the correlation coefficient (*R*), the coefficient of determination (R^2), and the adjusted R^2. These three measures help evaluate the strength of the relationship, the explanatory power of the model, and the model's suitability before interpreting the coefficients. Explicitly, Models 1 and 2 are outputs of multiple regression, whereas Model 3 is a moderation regression. Model 1 examines HQ as determined by PCE, Umt, and LS. Model 2 concerns Pvt, which is formed by PCE, Umt, LS, and HQ. Model 3 tests the moderating effect of HQ on the interaction between PCE, Umt, and LS in relation to Pvt. Broadly speaking, the *R* value is higher than both R^2 and adjusted R^2 in all models.

First, the *R* test is useful for explaining the strength of the simultaneous relationship between the dependent variable and all independent variables in regression modelling. The closer the *R* value is to 1, the stronger the model's ability to reveal the overall relationship between variables. Statistically, an *R* value close to 1 indicates an excellent fit for the overall model. Among the models compared, Model 1 has the highest *R* value at 0.938, followed by Model 2 with 0.935. Model 3 ranks last, with an *R* value of 0.919.

Second, the R^2 statistic is useful for determining the extent to which variation in the dependent variable can be explained by the independent or moderating variables in multiple regression and moderation models. The higher the R^2 value, the better the model's explanatory power regarding the observed data. Consistent with the *R* results, Model 1 exhibits the dominant R^2 value of 0.879, followed by Model 2 with an R^2 of 0.875, and Model 3 with an R^2 of 0.845. Specifically, 87.9% of the variation in HQ can be explained by PCE, Umt, and LS, while the remaining 12.1% is attributable to variables outside the model. Model 2 accounts for 87.5% of the variation in Pvt, determined by PCE, Umt, LS, and HQ, with 12.5% explained by other factors. Model 3 explains 84.5% of the variation in Pvt, as reflected by PCE, Umt, and LS through HQ, leaving 15.5% attributable to variables outside Model 3.

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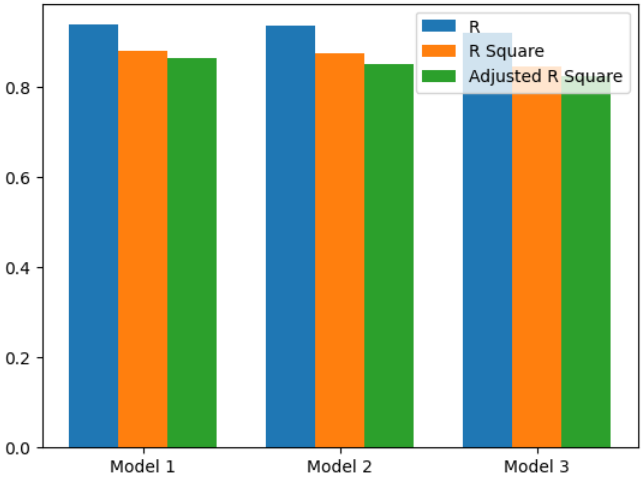

Figure 4. Comparison of Model Summary Tests

Source: Data was tabulated using SPSS and Python.

Third, the adjusted R^2 statistic verifies the regression model's ability to explain the variation in the dependent variable by taking into account the sample size, the number of independent variables, and the role of moderating variables. This measure is more accurate than R^2 because it corrects for potential bias arising from the inclusion of irrelevant variables. Similar to the previous R and R^2 outputs, the model with the highest adjusted R^2 (Model 1) is considered the best, as it achieves the optimal balance between explanatory power and model complexity. Model 1, with an adjusted R^2 of 0.864, indicates that PCE, Umt, and LS explain 86.4% of the variation in HQ after adjustment. In Model 2, the adjusted R^2 of 0.852 shows that 85.2% of the variation in Pvt is explained by PCE, Umt, LS, and HQ. Figure 4 also explains that the adjusted R^2 in Model 3 reaches 0.825, leading to the conclusion that 82.5% of the variation in Pvt is accounted for by PCE, Umt, and LS through HQ.

Classic Assumption Test

The classical assumption tests at this stage of research include assessments for multicollinearity and autocorrelation. The multicollinearity test utilises the Variance Inflation Factor (VIF) to detect the presence or absence of multicollinearity among independent variables, both in isolation and when interacting with moderating variables. Additionally, the autocorrelation test employs the Durbin–Watson (D–W) statistic to evaluate the presence or absence of autocorrelation in the residuals of panel data. Quantitatively, the thresholds for the multicollinearity test are as follows: (1) VIF < 5 = very weak multicollinearity and is considered very good, and (2) VIF < 10 = no multicollinearity. The autocorrelation test is interpreted according to three criteria: (1) a D–W value close to 2 = no autocorrelation, (2) a D–W value < 2 = positive autocorrelation, and (3) a D–W > 2 = negative autocorrelation.

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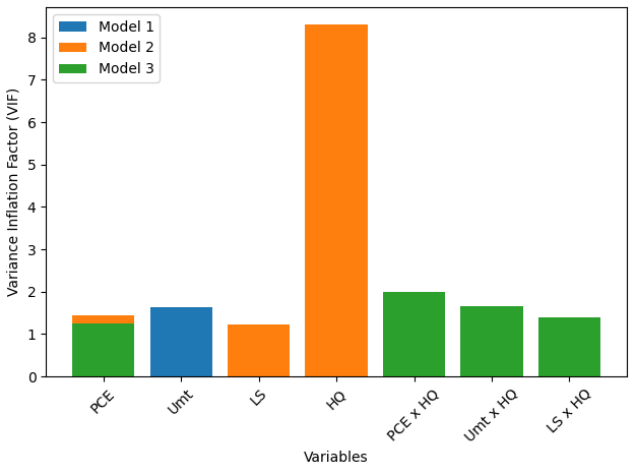

Figure 5. Comparison of VIF Statistics across Three Models

Source: Data was tabulated using SPSS and Python. (Noted: x = interaction effect)

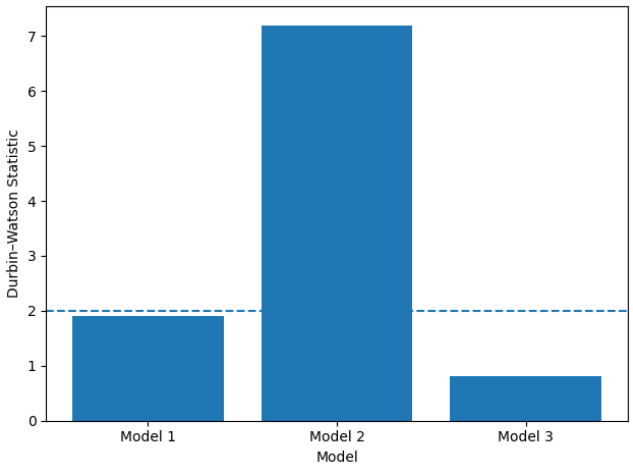

Figure 6. Comparison of D–W Statistics across Three Models

Source: Data was tabulated using SPSS and Python.

Figure 5 presents the outputs of the multicollinearity test. To date, no significant multicollinearity has been detected in the three models analysed. In the overall model, both the overall VIF value and the individual variable values do not exceed 5, indicating weak multicollinearity and excellent classification. Upon closer examination, Model 1 exhibits the lowest VIF values compared to the other two models. Model 1 has an average VIF of 1.432, with the highest VIF observed for the variable Umt at 1.643, followed by PCE at 1.444, and LS with the lowest at 1.21. Model 3 ranks second, with an average VIF of 1.676. More specifically, the variable PCE × HQ has the highest VIF of 1.986, followed by Umt × HQ at 1.651, and LS × HQ at 1.391. Model 2 ranks third, with an average VIF of 4.652. Although this average is below and close to 5, a detailed inspection reveals two variables, HQ (8.296) and PCE (7.183), with VIF values still within the acceptable tolerance limit (VIF < 10), indicating no multicollinearity. Notably, the other two variables in model 2, Umt (1.9) and LS (1.228), also have VIF values below the threshold (VIF < 5).

The dotted line at the value of 2 represents no autocorrelation. Referring to Figure 6, it is evident that Model 1 has a D–W value of 1.449, which is the highest compared to Model 3

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(1.247) and Model 2 (0.81), which ranks third. None of the models in this study have a D–W value close to 2, which would indicate more ideal residual conditions. The D–W test revealed that the statistical values for all three models remain below the ideal value of approximately 2. This empirical finding suggests the presence of potential autocorrelation in the model residuals. Hence, the regression results should be interpreted with caution, as autocorrelation can lead to less efficient coefficient estimates.

Hypothesis Test

Hypothesis testing was conducted to determine whether the constructed hypotheses could be supported. Two significance thresholds were applied: a 1% level ($\alpha = 0.01$) and a 5% level ($\alpha = 0.05$). Based on Table 3, both positive and negative relationships were found between the variables. In Model 1, partially, PCE ($\beta = 0.832$, $p = 0.000 < 0.01$) and Umt ($\beta = 0.176$, $p = 0.017 < 0.05$) significantly increased HQ. However, LS did not significantly decrease HQ ($\beta = –0.046$, $p = 0.567 > 0.05$). In Model 2, partially, Umt ($\beta = –0.315$, $p = 0.006 < 0.01$), LS ($\beta = –0.148$, $p = 0.029 < 0.05$), and HQ ($\beta = –0.687$, $p = 0.005 < 0.01$) significantly reduced Pvt. Inversely, although PCE also reduced Pvt, the result was not significant ($\beta = –0.039$, $p = 0.847 > 0.05$). In Model 3, examining indirect relationships, there was a significant negative interaction between PCE ($\beta = –0.057$, $p = 0.000 < 0.01$) and Umt ($\beta = –0.041$, $p = 0.001 < 0.01$), moderated by HQ on Pvt. Nevertheless, the negative interaction involving LS moderated by HQ on Pvt was not significant ($\beta = –0.016$, $p = 0.111 > 0.05$). This implies that, through the moderating role of HQ, all three variables can reduce Pvt, but only PCE and Umt have a statistically significant impact, whereas LS does not.

Table 3.
Summary of Hypothesis Test Results

Variables	Model 1 (HQ as the dependent variable)	Model 2 (Pvt as the dependent variable)	Model 3 (Pvt as the dependent variable with HQ interaction)
ln(PCE)	0.832** (0.000)	–0.039 (0.847)	--
Umt	0.176* (0.017)	–0.315** (0.006)	--
ln(LS)	–0.046 (0.567)	–0.148* (0.029)	--
ln(HQ)	--	–0.687** (0.005)	--
ln(PCE) x ln(HQ)	--	--	–0.057** (0.000)
Umt x ln(HQ)	--	--	–0.041** (0.001)
ln(LS) x ln(HQ)	--	--	–0.016 (0.111)
Constant	3.493** (0.000)	411.2** (0.000)	105.424** (0.000)
Lower bound (CI)	3.154	212.714	65.915
Upper bound (CI)	3.833	609.683	144.934
F-test	55.938** (0.000)	38.334** (0.000)	41.766** (0.000)
Std. error	0.007	0.904	0.983
Sample	108	135	189

Source: Data tabulated via SPSS.
*Noted: x = interaction effect; * = p < 5%; ** = p < 1%.*

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Other empirical facts are also presented in Table 3, where all regression models are deemed appropriate for use. In Model 1, PCE, Umt, and LS are simultaneously and significantly related to HQ (p = 0.000 < 0.01). In Model 2, PCE, Umt, LS, and HQ are simultaneously and significantly related to Pvt (p = 0.000 < 0.01). Similarly, in Model 3, PCE, Umt, and LS, moderated by HQ, are simultaneously and significantly related to Pvt (p = 0.000 < 0.01).

Discussion

In this session, the implications of the current findings were discussed and compared with scientific works addressing similar issues. Of the ten proposed hypotheses, nine were supported, and only one was contradicted. PCE and Umt were tested against HQ (H1 and H2 accepted), while LS was tested against HQ (H3 was rejected). In many cases worldwide, greater per capita expenditure—whether measured as income or health spending—is consistently associated with better health outcomes, as higher economic resources enable households and individuals to access adequate nutrition, medical care, and preventive services, thereby sustainably improving the population's health quality. This idea is also reflected in a manuscript projecting that increasing per capita expenditure correlates with measurable health pillars, such as increased life expectancy and reduced mortality rates, in line with the Preston curve relating income and health outcomes in Latin American countries (Williams et al., 2016). Similarly, lower unemployment—or declining unemployment rates—can enhance psychosocial well-being by alleviating financial insecurity, which in turn is positively correlated with better health outcomes. This relationship is also literally demonstrated by mortality and unemployment patterns in emerging markets such as Indonesia. The increase in unemployment is associated with a deterioration in health conditions. Conversely, labour supply has an insignificant negative effect on health quality in some models, as a substantial increase in available labour does not automatically improve individual health unless it is accompanied by a supportive healthcare system and decent wages and working conditions. The health response to labour supply may also be diminished by factors such as underemployment, long working hours amid uncertainty, and the predominance of informal work, all of which cause mental and physical stress that counteracts the systematic impact of income itself (Sohidin, 2025).

An increase in per capita expenditure has the potential to improve public health. In theory, per capita expenditure reflects households' economic capacity to meet basic needs. Cross-country research indicates that growth in income and health expenditure has a positive causal relationship with health indicators such as mortality rates and life expectancy. An analysis of OECD countries found that income levels are among the primary determinants of health expenditure and the demand for health services, which ultimately contribute to improvements in public health (Szymańska, 2023). A cross-country study on the relationship between health expenditure and health outcomes, conducted by Vărzaru (2025), shows that greater investment in the health system can improve population health indicators while bolstering the resilience of the health system in the long term.

Picchio and Ubaldi (2024) predict that rising unemployment may lead to a decline in health outcomes. This causal relationship is attributed to the psychological and economic pressures experienced by individuals upon losing their jobs. An international meta-analysis indicates that unemployment negatively affects health, particularly psychological well-being and mental health. Similar findings are reported in other empirical studies, which show that unemployed individuals are more likely to experience life dissatisfaction and psychological stress compared to those in employment (SenGupta, 2025). Progress in labour force participation has the potential to improve health outcomes through greater household income

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stability. With high levels of economic activity, labour force participation also benefits from spillover effects, as expanded access to economic resources facilitates more inclusive health and medical services. However, some studies suggest that this relationship is not always linear, especially when increased labour force participation occurs alongside a trend of underemployment, particularly in low-wage informal jobs. In this context, income instability and work-related pressures can adversely affect workers' health (Pratap et al., 2021).

In the case of IKN, per capita expenditure often reflects the economic capacity of individuals or households to access better nutrition, health services, and disease prevention. As indicated by the Organisation for Economic Co-operation and Development (2023), increases in per capita income and expenditure are associated with structured health outcomes, such as increased life expectancy and reduced mortality rates, as higher income enables more optimal health consumption and access to quality medical services in many countries worldwide. Although numerous epidemiological studies document that unemployment has a direct negative impact on physical and mental health, evidence from the United States suggests that in certain contexts (*e.g.*, when alternative measures such as community support and social protection are implemented), a decrease in unemployment rates can alleviate psychosocial stress and financial pressure, as well as stimulate collective prosperity, ultimately facilitating greater access to healthcare services (Cylus & Avendano, 2017). In other places, such as China, health quality can be improved when balanced with individual productivity—boosting innovation at work and managing unexpected medical expenses—so that family income rises alongside a robust capacity to withstand poverty (Li et al., 2025). A shift towards improved public health status can reduce medical costs and increase productivity, thereby assisting residents in escaping the poverty trap.

PCE, Umt, LS, and HQ are measured against Pvt (H4, H5, H6, and H7 accepted). High per capita expenditure reflects an increase in consumption and purchasing power among households and individuals, enabling them to meet basic needs such as food, health services, and education. These three basic needs form the foundation for reducing poverty levels. The phenomenon observed in IKN is also recorded in the literature, which demonstrates the negative relationship between per capita expenditure and poverty. From a macroeconomic perspective, labour supply is the backbone of the economy; its function can help combat poverty if accompanied by improved employment opportunities and productivity, thereby generating greater income prospects for poor households. At the national scale, a study by Zendrato et al. (2025) reveals that variables such as labour have a negative effect on poverty when combined with other variables such as health and per capita expenditure. More broadly, a dramatic decline in global unemployment is often followed by increased access to formal employment, which provides more stable incomes and enables poor households to escape the cycle of poverty. This change aligns with the growth-poverty relationship model, which involves growth in consumption levels and employment opportunities (Bourguignon, 2003).

In particular, H4 suggests that an increase in per capita expenditure contributes to a reduction in poverty, as the rise in household consumption capacity enables the fulfilment of basic needs such as healthcare, food, and education. This finding aligns with various cross-country studies indicating that growth in household consumption optimally reduces poverty levels by increasing people's purchasing power. For example, a manuscript by Perez-Trujillo and Lacalle-Calderon (2020) on the relationship between household consumption, economic growth, and poverty in several developing countries explains that an increase in household expenditure plays a vital role in reducing poverty through mechanisms related to welfare and access to basic services.

Regarding H5, H6, and H7, these hypotheses reflect the relationship between labour market

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dynamics, poverty, and health. H5 suggests that rising unemployment tends to exacerbate poverty levels due to the economic vulnerability caused by the loss of a household's primary source of income. Contrarily, H6 emphasises that optimal labour force participation can reduce poverty by increasing opportunities to earn an income, particularly when accompanied by the creation of productive jobs. Meanwhile, H7 asserts that better health outcomes contribute to poverty reduction, as healthy individuals are more likely to maintain income stability through enhanced labour productivity. For example, cross-country quantitative evidence indicates that health is a vital pillar of human capital, contributing to poverty reduction by boosting household economic capacity and labour productivity (Bleakley, 2010; Magida et al., 2025; Olopade et al., 2019).

PCE, Umt, and LS are moderated by HQ on Pvt (H8, H9, and H10 accepted). In economic development practices in IKN, higher per capita expenditure enhances people's capacity to consume basic necessities. Consequently, poverty levels are declining as residents gain access to more stable social and economic resources. A paper by Popova (2023), encompassing middle- and low-income countries across Africa, Asia, Europe, and the Americas, demonstrates that progress in per capita income are associated with greater community prosperity and reduced poverty rates. Moreover, the reduction in unemployment through the creation of productive jobs has increased the income of previously vulnerable households, thereby improving their chances of escaping poverty and lessening their reliance on social assistance. This aligns with development literature, which identifies employment opportunities as a fundamental pillar of poverty alleviation. Furthermore, a more rapid labour supply, when supported by good health, enhances labour employability and productivity, as healthy workers tend to possess higher job skills, engage more effectively in the economy, and incur lower health costs and absenteeism. This understanding aligns with previous studies indicating that optimal health status can strengthen the relationship between labour participation and household welfare, thereby helping to reduce poverty.

H8 suggests that health status significantly amplifies the impact of per capita expenditure on poverty reduction. In principle, an increase in household expenditure will have a greater effect on well-being if the population is in good health. Healthy individuals possess higher productive capacity and are better able to utilise economic resources. Cross-country studies conclude that investment in health enhances income, consumption, and labour productivity, thereby promoting household well-being (Bloom & Canning, 2008). Furthermore, H9 and H10 highlight that health quality can moderate the relationship between labour market dynamics and poverty. According to H9, health status can mitigate the negative impact of unemployment on poverty, as individuals in better health tend to have a greater ability to re-enter the labour market or adapt to economic changes. At the same time, H10 suggests that health status can also reinforce the impact of labour force participation on poverty reduction, as healthy workers generally exhibit higher productivity and greater work capacity, alongside lower rates of absenteeism. Wang and Wang (2020) emphasise that better health is closely linked to improvements in household income and increased labour force participation, which ultimately contribute to improved economic well-being and poverty reduction.

CONCLUSION

This paper employs multiple regression and moderation techniques with panel data to navigate the relationships between per capita expenditure, unemployment, and labour supply on poverty, both with and without considering the role of health quality in the IKN object. The findings reveal several key points. First, per capita expenditure and unemployment significantly contribute to improvements in health quality. Second, unemployment, labour supply, and health quality are shown to significantly reduce poverty. Third, health quality is demonstrated to be a driving force through which per capita expenditure and unemployment

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effectively reduce poverty.

Based on the conclusions, several practical recommendations are proposed. First, local governments and the IKN authority should formulate poverty alleviation policies that prioritise health quality as a key element of development, given that health quality has been proven to have a significant impact, both directly and as a supporting factor, in enhancing the influence of per capita expenditure and unemployment on poverty reduction. Second, since unemployment is the only variable that consistently demonstrates a significant impact—both negative and positive—across all tested models, the government must improve existing regulations and establish specific mechanisms to stimulate growth in people's purchasing power by strengthening productive economic activities, thereby creating sustainable employment. Third, optimising the labour supply should be integrated with a system that improves both the quality of and access to health services in a coordinated manner. A comprehensive policy approach involving the economic, health, and employment sectors is essential to ensure that poverty reduction and community welfare in the IKN are achieved effectively and sustainably.

Although this paper has provided valuable insights supported by robust empirical evidence, several weaknesses remain that warrant further investigation in the literature. Firstly, the variables employed are limited, as the study did not consider other factors that could potentially influence poverty in the IKN, such as infrastructure quality, education levels, regional fiscal financing, and population migration. Secondly, other studies should incorporate more nuanced health quality measurements, as aggregate indicators fail to capture specific dimensions of health, including access to healthcare services, environmental quality, and nutritional status. Thirdly, the use of panel data may give rise to issues of heterogeneity and endogeneity, which have not been fully addressed. Therefore, it is recommended to adopt more advanced methodologies, such as spatial approaches and dynamic regression, by broadening the regional scope and extending the analysis period, thereby enabling a more comprehensive understanding of the dynamics of poverty in the IKN

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