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# Inter Provincial Youth Human Capital Mapping and Its Implications for Economic Growth Policy in Indonesia

**Qorinul Huda***

Statistician at BPS – Statistics Tulang Bawang Barat Regency, Lampung, Indonesia
*E-mail: qorinulhudaofficial12@gmail.com

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**ABSTRACT**

*Youth are a strategic national asset because they are of productive age, determining the direction of future economic development. This study is based on the hypothesis that the quality of youth human capital influences economic growth across provinces in Indonesia. Data are sourced from the Central Statistics Agency (BPS) in 2024, with 38 provinces as analysis units. The methods used include biplot analysis to map variations in youth human capital indicators (education, health, and employment) and multiple linear regression to examine their influence on per capita economic growth. The results show disparities in youth human capital across provinces, with Java and parts of Sumatra being relatively superior compared to eastern Indonesia. Health and employment factors have been shown to influence economic growth, while education shows a contradictory relationship due to the phenomena of skill mismatch and time lag. These findings confirm that human development, especially youth development, is a crucial foundation for achieving the 2025–2045 RPJPN targets towards an Advanced Indonesia. Mapping human capital potential allows for targeted local-scale policy mapping.*

## Introduction

Indonesia has established an ambitious vision known as *Indonesia Emas 2045*, which aims to transform the country into a high-income developed nation by the centennial of its independence. The National Long-Term Development Plan (*Rencana Pembangunan Jangka Panjang Nasional* / RPJPN) emphasizes that this vision positions Indonesia as one of the world's five largest economies, with a targeted economic growth rate of 8 percent. Achieving this target requires consistent, inclusive, and sustainable economic growth (Ponto, 2023). Economic growth is not merely reflected in increases in Gross Domestic Product (GDP). It serves as a

fundamental foundation for job creation, income improvement, and the equitable distribution of welfare across regions (Yuliyanti et al., 2025).

Achieving this vision requires cooperation among all components of the nation. In the context of long-term development, youth constitute strategic actors (W. Ningsih, 2023). The role of youth is highly central in contributing to the realization of economic growth (Mulia et al., 2025). According to Law of the Republic of Indonesia (UU RI Nomor 40 tahun 2009) youth are defined as Indonesian citizens aged between 16 and 30 years. Youth represent a strategic development asset because they belong to the productive age group that determines the quality of the current and future labor force (Purba et al., 2024). In Indonesia, the youth population in 2024 accounts for approximately one-fifth of the total population, or around 64.22 million individuals, and serves as a key driver of the demographic dividend. Youth play a crucial role in harnessing the demographic dividend, which refers to a period when the proportion of the productive-age population aged 15 to 64 years exceeds that of the non-productive-age population (Satyahadewi et al., 2023). They act as agents of change capable of promoting economic growth, innovation, and sustainable development. Youth occupy a strategic position by contributing optimally through high-quality human capital to support Indonesia's development vision, particularly in terms of national economic growth. If the quality of youth can be enhanced, they will become the driving force of national economic growth. However, if their quality remains low, the demographic dividend risks turning into a demographic burden, manifested in high youth unemployment and low labor productivity (Aini et al., 2025).

However, Indonesia's economic growth has stagnated over the past decade. Figure 1 illustrates that economic growth has tended to remain at approximately 5 percent. This performance places Indonesia at risk of remaining a developing country trapped in the middle-income trap (Todaro & Smith, 2011). In contrast, achieving the target of becoming a developed country by 2045 requires a higher and more consistent rate of per capita economic growth to enhance national competitiveness and sustainably improve societal welfare.

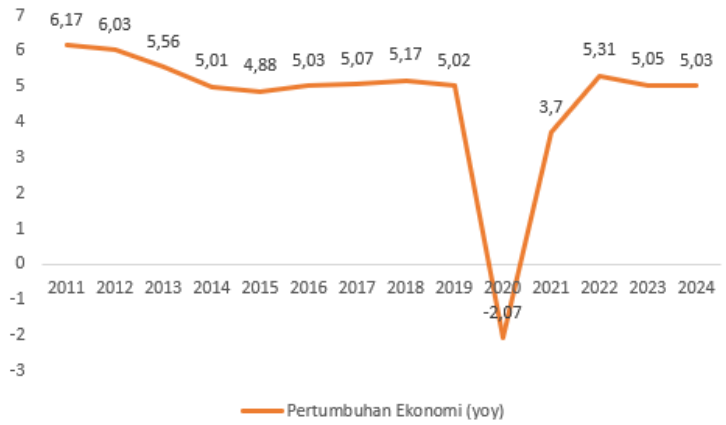


**Figure 1.** Economic Growth Indonesia (yoy) 2011 – 2024

*Source : Badan Pusat Statistik*

National economic growth is closely associated with the contribution of Gross Domestic Product (GDP) from various regions. However, these contributions continue to exhibit significant disparities across islands. Java dominates the national economy, contributing approximately 57.02 percent of national GDP, followed by Sumatra with a contribution of 22.12 percent. Meanwhile, economic growth rates vary across regions. Kalimantan recorded a growth rate of 5.52 percent, Sulawesi 6.18 percent, Bali and Nusa Tenggara 5.04 percent, while Maluku and Papua achieved as high as 7.81 percent, the highest among all regions. These disparities in both contribution and growth rates indicate that Indonesia's economic potential has not yet developed evenly across regions.

One of the main factors influencing economic productivity across regions is the quality of human capital (G. Mankiw et al., 1992). The Indonesia 2045 Long-Term Development Plan emphasizes that productive sectors in Indonesia continue to face relatively low levels of productivity, which have even shown a declining tendency. This condition is closely related to youth human capital, limited research and innovation capacity, and the suboptimal development of knowledge infrastructure. These challenges are reflected in Indonesia's Human Capital Index (HCI), which reached only 0.54 in 2020. This indicates that a child born in Indonesia is expected to achieve only 54 percent of their potential lifetime productivity, even if they receive adequate education and health services. Although this figure represents a slight increase from 0.53 in 2018, Indonesia's position at 96th out of 174 countries suggests that the quality of its human capital remains lagging behind that of several other Southeast Asian countries, particularly in terms of learning outcomes, health, and workforce readiness.

Other empirical findings further reinforce the urgency of improving the quality of human capital. Huda & Istiana (2024) conclude that although investments in human capital development have been stimulated by economic growth and globalization, the scale of returns to such investments has not yet made a significant contribution to accelerating national economic growth. The mismatch between investment and productivity outcomes indicates the need for development strategies that are more adaptive to local conditions. Therefore, human capital policies should be designed in a more targeted manner based on regional characteristics, including demographic structure, the capacity of educational institutions, technological readiness, and regional economic potential. Such a spatial and locally driven approach is expected to strengthen regional competitiveness while simultaneously enhancing national productivity in a more sustainable manner.

Mapping youth human capital across provinces is crucial for supporting the formulation of effective and equitable economic growth policies in Indonesia. Differences in educational attainment, workforce skills, health conditions, and digital technology proficiency among youth across provinces reflect disparities in productive capacity that directly affect regional economic performance. Without comprehensive mapping, human resource development policies risk being uniform in nature and insufficient in addressing region-specific needs. Such mapping

enables the identification of provinces with high youth human capital potential as well as those that remain lagging behind. Policy interventions, including the strengthening of vocational education aligned with local economic potential, improvements in the quality of job training, and strategies for enhancing youth labor absorption, can therefore be designed in a more targeted manner. Ultimately, interprovincial mapping of youth human capital not only supports more balanced development but also strengthens the role of youth as a driving force of sustainable national economic growth toward the achievement of *Indonesia Emas 2045*.

Several previous studies have examined the relationship between human capital, youth, and economic growth in Indonesia, but their focus and approaches remain limited. Satyahadewi et al (2023) emphasize the role of human resource quality in harnessing the demographic dividend, yet their analysis is still at the national aggregate level and does not highlight differences in youth capacity across regions. Purba et al (2024) investigate youth human capital in the context of regional development inequality, but they place greater emphasis on education and have not comprehensively integrated health, skills, and digital literacy dimensions. Meanwhile, Mulia et al (2025) highlight the role of youth entrepreneurship in economic growth, but they do not explicitly link it to the spatial mapping of youth human capital across provinces. International studies such as World Bank (2020) and ILO (2022) also provide important insights into youth employment challenges in Indonesia, yet they remain largely descriptive and do not connect variations in youth quality across provinces with policy implications for region-based economic growth. Based on these reviews, the research gap of this study lies in the absence of a comprehensive interprovincial mapping of youth human capital and its direct linkage to regional economic growth and national policy formulation. This study is expected to fill that gap by adopting a more integrative approach that is relevant to the *Indonesia Emas 2045* agenda.

Based on the urgency and issues described above, a more in-depth mapping of human capital quality is required, particularly among youth as the productive generation that will become the driving force of economic development. Therefore, this study aims to: (1) describe and map youth human capital indicators for each province, (2) analyze the influence of youth human capital on economic growth, and (3) derive region-based human capital policy implications for national economic growth.

## Literatur Review

One of the main factors influencing economic productivity across regions is the quality of human capital (G. Mankiw et al., 1992). Youth quality is closely related to human capital. Becker (1918) argues that education, skills, and health constitute forms of investment that can enhance labor productivity in the future. Endogenous growth theory emphasizes that internal factors, such as knowledge, innovation, and skills, are the primary drivers of long-term productivity (Romer, 1990; Barro, 2001). Furthermore, the Solow model and its modifications explain that one of the key channels to stimulate economic growth is through the enhancement of high-quality

human capital (G. Mankiw et al., 1992). High-quality human capital refers to productivity levels that enable the generation of large and efficient scales of economic management (Wahid et al., 2024). In other words, investment in youth human capital is not only socially important but also economically essential for promoting long-term growth.

Furthermore, modern growth theory emphasizes that human capital among the young generation has a dual effect on economic development. First, it increases productivity directly, as skilled young workers can produce greater output with the same input (Lucas Jr, 1988). Second, it generates externality effects, whereby educated and healthy youth more quickly adopt and develop new technologies, thereby promoting innovation and sustainable growth (Todaro & Smith, 2011). Thus, economic development through the strengthening of youth human capital becomes one of the most effective pathways to accelerate Indonesia's transformation into a developed country (Lucas Jr, 1988). Human capital characteristics consist of the dimensions of education, health, and employment. In the education dimension, the quality of youth human capital is measured by School Participation Rate (Angka Partisipasi Sekolah – APS) and Average Years of Schooling (Rata-rata Lama Sekolah – RLS). The School Participation Rate reflects youth access to and participation in the formal education system, while the Average Years of Schooling reflects the accumulation of educational investment that directly contributes to increased labor productivity (Becker, 1918 ; Mankiw et al., 1992). Endogenous growth theory posits that improvements in education increase individuals' capacity to absorb knowledge and technology, thereby positively impacting long-term economic growth (Romer, 1990 ; Lucas Jr, 1988).

The health dimension of youth is represented by the youth morbidity rate and the youth smoking rate. Health is an essential component of human capital because it determines an individual's physical and mental capacity to work productively. A high morbidity rate reflects a decline in health quality that can hinder labor productivity and reduce economic efficiency (Grossman, 1972). Meanwhile, smoking behavior among youth has long-term implications for health and productivity, and it has the potential to increase the economic burden through reduced effective working hours and higher healthcare costs (WHO, 2020). Therefore, these two health indicators are expected to have a negative effect on regional economic growth.

The youth employment dimension is measured by youth skills, the youth open unemployment rate (Tingkat Pengangguran Terbuka – TPT), and youth working hours. Youth skills acquired through training or certification reflect the readiness of the workforce to meet the demands of the modern labor market and directly contribute to productivity improvement and regional competitiveness (ILO, 2022). Conversely, a high youth open unemployment rate indicates inefficiencies in the utilization of human capital, which can suppress economic output and slow growth (Blanchard & Johnson, 2013). Youth working hours reflect the intensity of labor utilization in the production process; the more optimal the productive working hours, the greater the youth contribution to regional economic output (Borjas, 2016).

The conceptual framework of this study is grounded in economic growth and human capital theories, which position the quality of human resources, particularly youth, as a primary determinant of regional productivity and economic growth (Mankiw et al., 1992 ; Becker, 1964). However, the achievement of economic growth is not distributed evenly across regions. Regional inequality theory explains that differences in structural characteristics, human resource capacity, and labor market dynamics lead to disparities in economic performance across areas (Myrdal, 1957; Williamson, 1965).

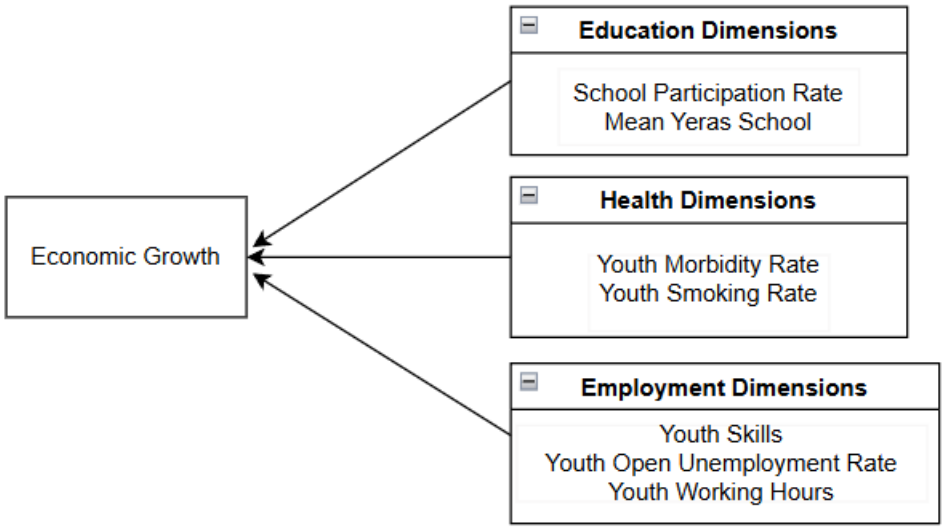


**Figure 2.** Research Framework

## Research Methods

This study uses 38 provinces in Indonesia as the unit of observation, with eight research variables for the year 2024 organized into three dimensions of human capital. The secondary data sources are derived from the Indonesian Central Statistics Agency (Badan Pusat Statistik). The dimensions of Indonesian youth human capital consist of education, health, and employment. The variables for each dimension are based on the Youth Statistics published by the BPS – Statistics of Indonesia.

**Table 1.** Operational Research Variables

| Variable | Notation | Operational Definition | Dimensions |
|---|---|---|---|
| Economic Growth | $y$ | Gross regional domestic product per capita at current prices | - |
| School Participation Rate (APS) | $x_1$ | School Participation Rate (Angka Partisipasi Sekolah - APS) is the proportion of the population in a certain school age group | Education |

| Variable | Notation | Operational Definition | Dimensions |
|---|---|---|---|
| | | who attend school compared to the total population in the same school age group. | |
| Mean Years School | $x_2$ | Average Years of Schooling (Rata-rata Lama Sekolah – RLS) is the average number of years completed by the population aged 15 years and older in formal education, excluding years of repetition. | Education |
| Youth Morbidity Rate | $x_3$ | Youth Morbidity Rate (Angka Kesakitan Pemuda – AKP) is the percentage of youth who experience health complaints that disrupt their daily activities. | Health |
| Youth Smoking Rate | $x_4$ | Youth Smoking Rate (Tingkat Pemuda Merokok – TPM) is the average number of cigarettes smoked per day. | Health |
| Youth Skills | $x_5$ | Youth Skills (Skill Pemuda – SP) is the percentage of youth who participate in courses, training, or workshops and obtain a certificate. | Employment |
| Youth Open Unemployment Rate | $x_6$ | Youth Open Unemployment Rate (Tingkat Pengangguran Terbuka – TPT) is the percentage of unemployed individuals in relation to the total labor force. For youth, this refers to the percentage of unemployed individuals within the youth age group (16–30 years) who are part of the labor force. | Employment |
| Youth Working Hours | $x_7$ | Youth Working Hours (Jam Kerja Pemuda – JKP) is the average number of hours worked by youth in a week. | Employment |

The mapping of Indonesian youth human capital in each province is addressed using correspondence analysis and biplot, which are part of multivariate analysis. Multivariate analysis is a method in which one or more of more than two variables are analyzed simultaneously (Johnson & Wichern, 1998) on a dataset consisting of n observations and p variables. Correspondence analysis is a multivariate technique used to simplify and visualize categorical data in the form of a two-dimensional graph (Fitria, 2024). This method enables researchers to identify associations between variables and observe patterns within complex data. By transforming a contingency table into a graphical representation, correspondence analysis facilitates the interpretation of relationships between variable categories, thereby providing a clearer picture of the data structure (Greenacre, 2017). Meanwhile, biplot analysis is an exploratory multivariate technique used to simultaneously display observation objects and research variables in a two-dimensional plane (Gabriel, 1971). In biplot visualization,

provincial objects are displayed as points, while research variables are represented as vectors or arrows. Biplot interpretation is conducted based on several main principles. First, the proximity between object points reflects the degree of similarity in characteristics between regions. Regions that are close to each other have relatively similar human capital and economic growth profiles. Second, the length of a variable vector indicates the magnitude of that variable's contribution in explaining data variance. The longer the vector, the greater the role of the variable in distinguishing regional characteristics. Third, the angle between variable vectors represents the relationships between variables. An acute angle indicates a positive correlation, an obtuse angle indicates a negative correlation, and an angle approaching 90 degrees indicates a weak or non-correlated relationship (Gabriel, 1971 ; Abdi & Williams, 2010).

Next, to examine its effect on the national economy, the analysis is conducted using linear regression. Multiple linear regression is a quantitative analytical method used to examine the influence of youth human capital quality, represented by the dimensions of education, health, and employment, on national economic growth. For consistency with theory, a logarithmic transformation is applied to variables that are not already expressed as percentages, which reflects elasticity values (Gujarati & Porter, 2009). The linear regression model in this study is as follows:

$$\boldsymbol{log}\ (\boldsymbol{y_i}) = \boldsymbol{c} + \boldsymbol{log}(\boldsymbol{x_1}) + \boldsymbol{log}(\boldsymbol{x_2}) + \boldsymbol{log}(\boldsymbol{x_3}) + \boldsymbol{log}(\boldsymbol{x_4}) + \boldsymbol{x_5} + \boldsymbol{log}(\boldsymbol{x_6}) + \boldsymbol{log}\ (\boldsymbol{x_7})$$

Where i denotes the i-th province, and the logarithmic transformation allows for the interpretation of coefficients as percentages and elasticities (Gujarati & Porter, 2009).

The regression model resulting from the estimation must meet several criteria of model validity (Gujarati & Porter, 2009). In general, model validity consists of theoretical validity and statistical validity. Theoretical validity refers to the model's ability to plausibly explain causal relationships among variables. Statistical validity indicates that the model is a good fit and includes the F-test for simultaneity, the t-test for significance, the adjusted R-squared test for model fit, classical assumption tests, and multicollinearity detection. The classical assumption tests consist of normality (Shapiro-Wilk), homoscedasticity (Breusch-Pagan), and non-autocorrelation (Durbin-Watson). The Durbin-Watson statistic ranges from 0 to 4. A DW value close to 2 indicates the absence of autocorrelation in the residuals. Conversely, a DW value close to 0 indicates positive autocorrelation, while a DW value close to 4 indicates negative autocorrelation (Wooldridge, 2016). The decision rule for statistical testing is that if the p-value is less than the significance level, the conclusion is to reject the null hypothesis.

## Results and Discussion

Human capital is one of the fundamental factors driving economic growth, where the quality of education, health, and skills of the young workforce constitute the main components determining long-term productivity (Becker, 1918). Youth, as an early productive age group, play a strategic role in development because they not only provide new labor supply but also have the potential to act as agents of innovation and social transformation (Boediman, 2024). However, the quality of youth human capital in Indonesia still shows considerable variation across provinces, which has implications for the uneven distribution of their contribution to national economic growth (Sambodo et al., 2022).

### *Youth Human Capital Profile and Mapping Across Provinces*

The correspondence analysis results in Figure 3 show different associations between provinces and the seven main youth human capital indicators, which encompass education, health, and employment aspects. The distribution pattern of these indicators indicates disparities in human capital development, where provinces in western Indonesia tend to outperform in the dimensions of education and skills, while eastern regions are more prominent in the working hours indicator despite relatively lower educational attainment (Fajriyah, 2024). This finding is consistent with the narrative of the RPJPN 2045, which states that disparities in human development remain a major challenge in regional development in Indonesia. The correspondence of indicators also shows that the larger the circle, the greater the value. Thus, each province can be identified based on which indicators tend to dominate (Dunning & Lundan, 2008).

In the education dimension, provinces on Java Island such as DI Yogyakarta, Central Java, and East Java exhibit high values in the School Participation Rate (SPR) and Average Years of Schooling (AYS). The high educational achievements in this region align with better educational infrastructure and a concentration of higher education institutions. Conversely, provinces in eastern Indonesia such as Papua, West Papua, and Maluku show relatively low SPR and AYS outcomes, reflecting disparities in access to formal education. This disparity reinforces Mankiw (2012) view that uneven educational investment will widen productivity inequality across regions.

In the health dimension, the youth morbidity rate is relatively high in provinces such as Bengkulu, West Nusa Tenggara, and Gorontalo, indicating health vulnerabilities that can reduce labor productivity (Huda & Istiana, 2024). On the other hand, the youth smoking rate is quite dominant in provinces in Kalimantan and Sulawesi, which indicates health behavior challenges that may affect the long-term quality of the workforce (Judijanto et al., 2025). According to Sen (1999) poor health not only reduces an individual's ability to work but also limits their opportunities to improve their quality of life and contribute to economic development.

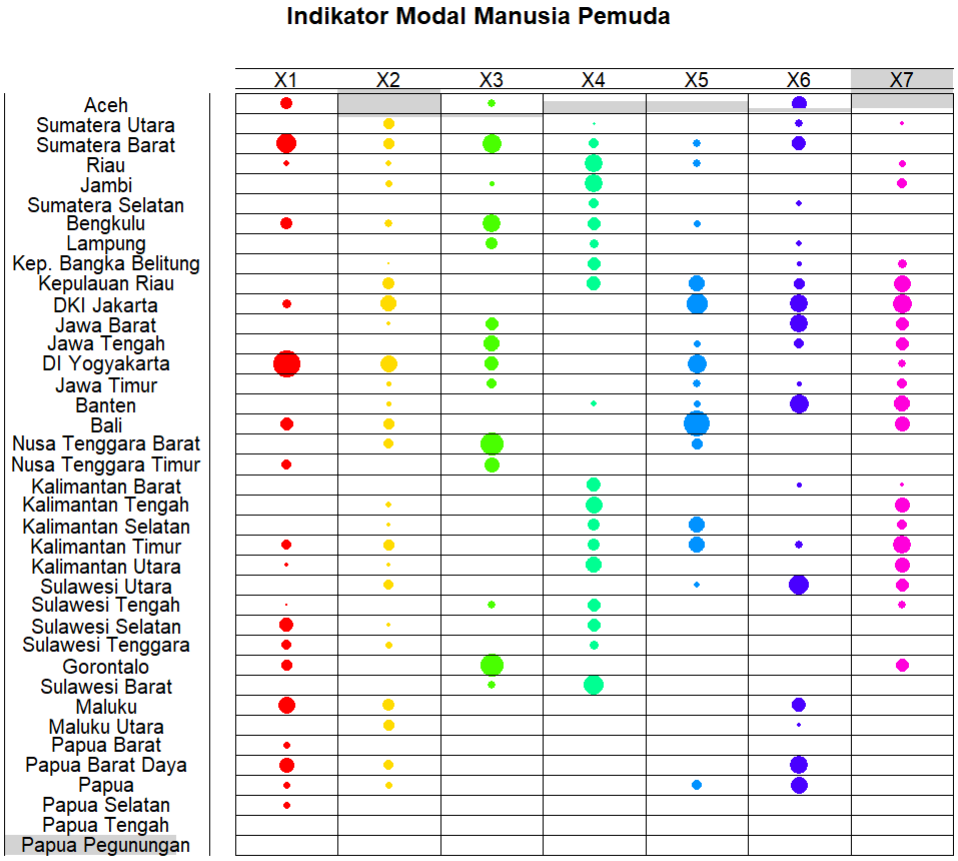


**Figure 3.** Correspondence of youth human capital indicators for each province

In the employment dimension, DKI Jakarta, West Java, and Banten show higher achievements in the youth skills indicator, reflecting better access to training and work certification. However, a paradox emerges when provinces with high skill achievements face relatively high youth open unemployment rates, such as in DKI Jakarta and West Java. This is consistent with Todaro (1969) theory of urban unemployment, which explains that in urban areas, despite relatively high labor quality, an imbalance between the number of job seekers and formal employment opportunities can lead to open unemployment. Conversely, provinces in Papua, West Papua, Kalimantan, and Sulawesi show dominance in the youth working hours indicator, with most youth absorbed in primary sectors such as agriculture, plantations, and mining. This phenomenon indicates that although youth in these regions work more, the quality of their work has low added value, thus limiting their contribution to economic growth (Suryanto, 2016).

In general, this exploratory analysis confirms the existence of variation in youth human capital development in Indonesia. The western regions tend to perform better in education and skills, but face challenges in the form of high open unemployment due to limited absorption of formal employment. Meanwhile, the eastern regions exhibit high youth labor force participation, yet still lag behind in terms of educational quality and formal skills. These disparities indicate that human capital development strategies should not only focus on improving the quality of

education and health, but also need to be accompanied by the creation of productive job opportunities that can optimally absorb young workers across all provinces. Therefore, this study underlines the importance of a more holistic and equitable human capital development approach. Aligned with the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequalities).

The biplot analysis provides an overview of the relationships between provinces and the seven youth human capital indicators, which are grouped into three main dimensions, namely education, health, and employment. Figure 4 shows that the two principal axes explain 60.4 percent of the data variance, with Dimension 1 accounting for 41.1 percent and Dimension 2 accounting for 19.3 percent. According to Jolliffe IT (2002) these values are sufficiently representative to present the structure of multidimensional data in two dimensions.

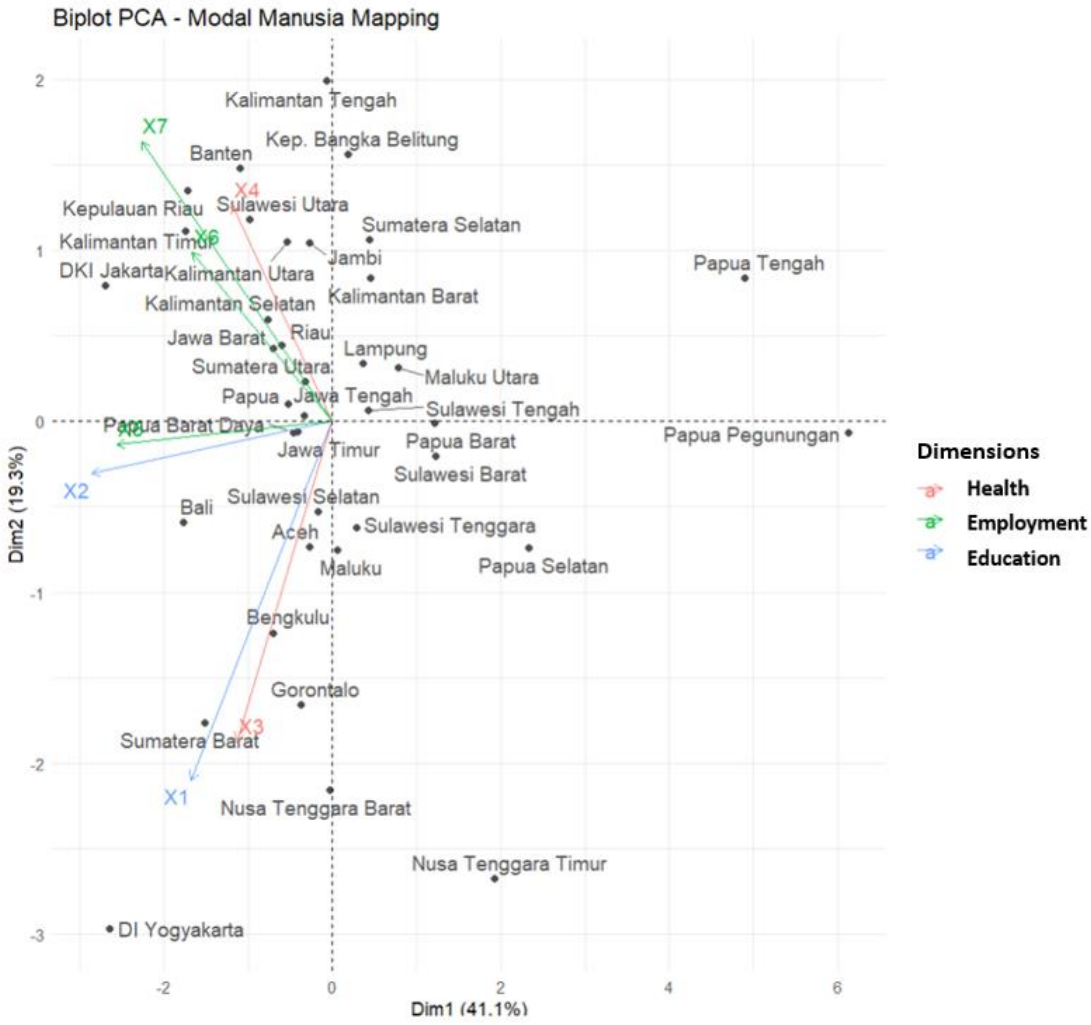


**Figure 4.** Biplot Mapping of Human Capital Across Provinces

The biplot analysis empirically shows that the differences in youth human capital quality across provinces in Indonesia are not random. This pattern forms a clear spatial and structural arrangement across the dimensions of education, employment, and health. Consistently, the Average Years of Schooling and Youth Working Hours variables emerge as the most dominant indicators in distinguishing provincial characteristics, as indicated by their relatively longer vectors compared to other indicators. This finding suggests that regional disparities are primarily driven by unequal youth educational attainment and the intensity of labor utilization (Efendi, 2025). Meanwhile, health factors play a more limited role in explaining inter-provincial variation. Provinces in Java and Bali are empirically concentrated on the side of the biplot that is strongly associated with education indicators, confirming the structural advantage of these regions in developing youth human capital based on formal education.

Furthermore, mapping the positions of provinces reveals regional differentiation in youth human capital characteristics. Papua and parts of the eastern region are empirically separated from the education cluster and are more associated with high youth working hours, reflecting dependence on the informal sector and low accumulation of education-based human capital (Poai et al., 2025). Conversely, urban provinces such as DKI Jakarta, West Java, and Banten occupy a moderate position characterized by relatively high youth skills but also high youth unemployment. This indicates a structural mismatch between labor quality and labor market absorption (S. F. Ningsih et al., 2025). These empirical findings confirm that disparities in youth human capital across regions are not only related to education levels but are also closely linked to labor market structure and regional economic characteristics, which ultimately have implications for uneven contributions to economic growth across provinces (Harsono et al., 2025).

### *The Impact of Youth Human Capital on National Economic Growth*

Based on the results of the classical assumption tests, the regression model used in this study meets the BLUE (Best Linear Unbiased Estimator) criteria (Gujarati & Porter, 2009). The normality test using Shapiro-Wilk shows a value of 0.4949, which is greater than the 5 percent significance level, indicating that the data are normally distributed. The heteroskedasticity test using Breusch-Pagan yields a value of 0.2155, which is also greater than 0.05, thus it can be concluded that there is no heteroskedasticity in the model. Furthermore, the autocorrelation test using the Durbin-Watson method shows a value of 0.3303, which indicates that there is no autocorrelation problem in the residuals. In addition, the multicollinearity test using the Variance Inflation Factor (VIF) indicator shows values below 10, indicating that the independent variables are not multicollinear.

**Tabel 2.** Asumptions Classical Results

| Classical Asumptions | Test or Detection | Results | Decision* |
|---|---|---|---|
| Normalitas | Shapiro Wilk | 0,4949 | The normality assumption is satisfied |
| Homoskedastisitas | Breusch-Pagan | 0,2155 | The homoscedasticity assumption is satisfied |
| Non Autokorelasi | Durbin Watson | 0,3303 | The non-autocorrelation assumption is satisfied |
| Non Multikolinieritas | VIF | < 10 | The non-multicollinearity assumption is satisfied |

**) Significance at the 5 percent alpha level*

Youth are an age group in transition from education to the labor market, so the quality of human capital they possess will greatly determine the direction of long-term economic development (Wößmann, 2003). Investment in education, health, skills, and access to technology are important factors that shape youth human capital and ultimately contribute to economic growth (Todaro & Smith, 2011).

**Tabel 3.** Hasil Pemodelan Regresi Penelitian

| Variables | Coefficient | *P-Value* t statistic | Decision* |
|---|---|---|---|
| Dependent Variable | | | |
| log (y) | - | - | - |
| Independent Variables | | | |
| c | 1,522 | 0,37924 | Not Significant |
| log ($x_1$) | 0,656 | 0,06391 | Not Significant |
| log ($x_2$) | -2,272 | 0,02766 | Significant |
| $x_3$ | -0,109 | 0,00136 | Significant |
| log ($x_4$) | 0,939 | 0,00303 | Significant |
| $x_5$ | 0,023 | 0,078745 | Not Significant |
| log ($x_6$) | 0,356 | 0,072635 | Not Significant |
| log ($x_7$) | 2,724 | 0,022155 | Significant |

**) Significance at the 5 percent alpha level*

The regression model in Table 3 has an F statistic of 7.256 with a p-value of 0.00004. These results indicate that at the 5 percent significance level, it can be concluded that at least one independent variable has an effect on the dependent variable. Furthermore, the R-squared value is 62.87 percent and the adjusted R-squared value is 54.2 percent. This indicates that the youth human capital indicators in Indonesia can explain 54.2 percent of the variation in economic growth, while 45.8 percent is influenced by other factors outside the model.

The estimation results show that the education dimension, proxied by the percentage of average years of schooling, has a negative effect on economic growth. Every 1 percent increase in the average years of schooling among youth leads to an average decrease in GRDP per capita of approximately 2.27 percent. This condition appears contradictory to human capital theory, which emphasizes the importance of education as a productivity investment (Becker, 1918). However, this finding aligns with the phenomenon of time lag and skill mismatch in Indonesia, where educational outcomes have not been fully absorbed by the labor market and thus have not yet made a direct contribution to increasing economic output (McGuinness et al., 2018). Consistent with Huda & Istiana (2024) Indonesian human capital is not yet fully qualified, so it has not had a significant impact on economic efficiency. This underscores that increasing years of schooling must be accompanied by improvements in quality and curriculum relevance so that educational outcomes align with labor market needs (Faridli et al., 2024). It can be concluded that quality is needed rather than quantity of schooling years. Youth should not only be equipped with theory but also ensured to be able to apply it for productivity.

Meanwhile, the percentage of school participation does not show a significant effect on economic growth. Broad access to education is indeed an important prerequisite for human capital development, but the results of this model indicate that access alone is not sufficient if it is not accompanied by the quality of learning and the provision of relevant skills (Psacharopoulos & Patrinos, 2018). Thus, the economic benefits of education will only emerge when education produces graduates who are able to contribute to value-added economic activities.

Youth health is proven to have a significant effect, with a negative relationship. A 1 percent increase in the youth sickness rate leads to a decrease in average GDP per capita of approximately 10.9 percent. This confirms the vital role of health as a determinant of labor productivity, as emphasized in the literature on the relationship between health and economic growth (Bloom & Canning, 2000). Healthy youth can work more efficiently, have higher productivity, and are more capable of absorbing new skills, making them a driving force for economic growth (Todaro & Smith, 2011).

An interesting finding emerges for the youth cigarette consumption variable, which surprisingly has a significant positive effect on economic growth. A 1 percent increase in youth cigarette consumption leads to an increase in average GDP per capita of 0.94 percent. Theoretically, this result contradicts the global health literature from WHO, since cigarette consumption has adverse effects on long-term productivity. The explanation for this finding is that cigarette consumption here

functions as a proxy for income level and urbanization. Regions with higher income tend to have higher cigarette consumption, so the relationship observed is correlational rather than causal. In fact, this result indicates that the economic structure should not be reliant on cigarette consumption (Almizi & Hermawati, 2018). Policy intervention and youth awareness are needed to shift toward other growth contributors (Rampai, 2021). To align this finding with the youth sickness variable, if cigarette smoking affects youth health in the long term, it will impact the productivity scale of human capital and thus reduce economic growth in the long run (Ranis et al., 2000). This finding suggests the need for caution in reducing the frequency of youth smoking.

Youth working hours have a positive effect on economic growth with a relatively large elasticity of approximately 2.72 percent. This finding indicates that the higher the youth working hours, the greater their contribution to increasing economic output. This is consistent with the literature that emphasizes the importance of labor force participation in growth. However, it should be noted that the positive effect of working hours will only be sustainable if the quality of youth employment has high added value, not merely low-intensity jobs that do not provide opportunities for skill enhancement (Malik, 2018).

In contrast, the youth skill variable, proxied by participation in job training, does not show a significant effect on economic growth. This can be interpreted as existing training programs being of insufficient quality, small in scale, or not relevant to labor market needs, thus limiting their contribution to productivity. Therefore, reforming the training system is important so that youth can be better prepared to face the dynamics of the labor market. Youth should not only pursue certification, but must also be able to sustainably utilize the potential of training outcomes to generate economic output.

The youth open unemployment rate is also not proven to have a significant effect on economic growth. This condition may be caused by heterogeneity in economic structures across provinces or the fact that youth unemployment in Indonesia more reflects a skill mismatch problem rather than a lack of pure job opportunities (McGuinness et al., 2018). A reduction in unemployment will only be meaningful if the jobs created match youth competencies, not merely increasing job opportunities in low-productivity informal sectors.

Overall, the results of the analysis show that youth health and youth engagement in the labor market are the most tangible factors driving economic growth, while education still faces challenges in quality and relevance. These findings imply that youth human capital development policies should be directed toward improving health, transforming the quality of education, and creating productive job opportunities that align with youth skills.

### *Policy Implications*

The policy implications of these findings are quite clear. First, the government needs to strengthen access to quality education across all provinces, especially in eastern Indonesia, to reduce disparities in human capital quality. These results

recommend mapping regional potential for optimizing youth human capital. With data-based mapping, policy formulation becomes more focused and prioritized based on evidence based policy. Second, improving preventive health services, particularly regarding smoking behavior and healthy lifestyles among youth, is important to maintain long-term productivity. At the grassroots level, the younger generation needs to be educated about the long-term dangers of frequent smoking. Policy interventions and reduction of smoking frequency are then needed in provinces with the highest smoking percentages, such as Sumatra and Kalimantan (Figure 3). Third, expanding adaptive skills training programs in line with digital technology developments can enhance the competitiveness of young workers in the global market. The ultimate goal of skills training is for youth to be able to work and create economic opportunities. Fourth, strategies to reduce youth unemployment through the creation of quality jobs and entrepreneurship programs must be an integral part of labor market policies. The government must maintain a balance between labor demand and supply. Youth human capital specifications must continue to be improved in line with the rapid development of technology. With this approach, youth contribution to economic growth can be optimized while strengthening national development resilience.

The findings of this study also have strategic implications in the context of the Indonesia Maju 2045 vision. Youth as a productive age group play a central role in realizing the transformation toward a high-income country. The mapping of youth human capital shows that Indonesia's demographic bonus can only be converted into a demographic dividend if the quality of youth education, health, and skills continues to be improved evenly across all regions (Bloom & Canning, 2000). In other words, interprovincial disparities in human capital quality must be viewed as a major challenge that needs to be addressed immediately through affirmative policies and more equitable distribution of development.

Within the framework of long-term development, the findings of this study emphasize that youth are not merely the successors of the nation, but also key actors in creating a globally competitive knowledge-based economy (Prathama & Yustika, 2021). Appropriate investment in youth human capital will enable Indonesia to escape the middle-income trap and transform into an advanced economy by 2045. If development strategies can integrate the results of youth human capital mapping with national policies, Indonesia has a significant opportunity to realize the vision of Indonesia Emas, namely a nation that is inclusive, innovative, and highly competitive at the global level.

## Conclusion

This study demonstrates that youth human capital plays a strategic role in driving economic growth across provinces in Indonesia, albeit with complex dynamics. The biplot analysis reveals differences in youth human capital capacities among provinces, where education, health, and employment interact to shape the quality of the young workforce. Meanwhile, the multiple linear regression results confirm that youth health and employment factors significantly influence per capita

economic growth, whereas education shows a paradoxical relationship due to skill mismatch and time lag. These findings underscore the importance of more targeted development policies to improve vocational education quality, expand productive employment opportunities, and strengthen youth health as a foundation for achieving Indonesia Maju.

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