JONHADIONO Research, Publisher and Consulting Institute

Published by: Jonhariono Research, Publication and Consulting Institute

ProBusiness: Management Journal

Factors Affecting the Human Development Index in Central Sulawesi 2017-2022

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ABSTRACT

Article history:

ARTICLEINFO

Received Jun 30, 2024 Revised Jul 15, 2024 Accepted Aug 02 2024

Keywords:

GRDP Central Sulawesi Human Developmnet Index This research aims to determine the influence of GRDP, Average Years of Schooling, and Life Expectancy on Central Sulawesi's Human Development Index (HDI). This research examines 6 years from 2017-2022 data, with 13 districts/cities. The analysis technique used is panel data regression analysis. The tool used to carry out testing is Eviews 9. The tests used in this research are the CEM, FEM, REM, Chow, Hausman, and Lagrange Multiplier (LM) tests. The research results show that (1) GRDP has a negative and significant effect on HDI, (2) Average Years of Schooling has a negative and significant effect on HDI (3) Life Expectancy has a positive and significant effect on HDI. The research results show that the GRDP variables, Average Years of Schooling, and Life Expectancy influence the Human Development Index in Central Sulawesi Province in 2017 -2022.

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1. INTRODUCTION

The Human Development Index was developed by Amartya Sen in his book *Development as Freedom* (Sen, 1999). The freedom meant by Sen is that society can feel prosperous as a result of the development achieved. This index prioritizes things that are more sensitive and detailed so that it is considered more effective and useful than just per capita income which is currently used. The four main elements in human development are productivity, equity, sustainability, and empowerment (UNDP, 1996).

The Human Development Index (HDI) is an indicator used to measure a region or country's level of human development. HDI includes several important factors, such as education, life expectancy, and per capita income. Central Sulawesi, as one of the provinces in Indonesia, has potential and challenges in human development (Bahasoan et al., 2024). 2017-2022 is important to analyze the factors influencing HDI in Central Sulawesi. During this period, the province experienced social changes in economics and politics that can impact human development indicators. Therefore, understanding the factors influencing HDI in Central Sulawesi during this period is important for formulating more effective and sustainable development policies.

Several factors influencing HDI in Central Sulawesi between 2017 and 2022 include the level of accessibility and quality of education in the region can significantly impact the literacy and qualification levels of the population. Factors such as the number of schools, qualified teachers, and population participation in education can influence the HDI. Factors such as access to health

services, health infrastructure, and public health programs can affect the life expectancy and wellbeing of the population. Infant mortality index, maternal mortality rate, and disease prevalence can also be important variables in HDI analysis. Per capita income, unemployment rate, and economic growth influence an individual's ability to meet basic needs and access resources. Inclusive economic growth and fair income distribution can contribute to increasing HDI. The availability and quality of infrastructure, such as transportation, energy, and access to basic services (clean water, sanitation, electricity), also play an important role in human development. Good infrastructure can improve accessibility and quality of life for residents (Pratama, 2020). According to BPS (2021), published data from the Central Statistics Agency presented that the HDI value in Central Sulawesi in 2022 will reach 70.28 percent. The HDI value, which reaches 70, indicates that there has been an increase in the status of human development in Central Sulawesi Province, namely "high" status.

The Human Development Index achieved by Central Sulawesi was 70.28, below Indonesia's HDI of 72.91. Judging from its position, Central Sulawesi's HDI is ranked 25th out of 34 provinces in Indonesia. When compared with the provinces on the islands of Sulawesi, Maluku and Papua (Sulampua), the level of human quality in Central Sulawesi is in fourth place after North Sulawesi (73.81), South Sulawesi (72.82) and Southeast Sulawesi (72. 23). The Human Development Index in Central Sulawesi in 2022 has a high status which has changed from high status in 2021. Based on BPS publication data, although from the last 6 years from 2017 to 2022 data, the HDI for Central Sulawesi has continued to increase. Judging from its position, Central Sulawesi's HDI is at level 25 out of 34 provinces in Indonesia. If examined per district/city, the number of districts/cities with "high" status in 2022 is still the same as in 2021, namely three districts, including Morowali, Poso, and Banggai. Palu City has become a Regency/City with a "very high" HDI status since 2017. The difference between this research with previous research is the variables used, where the variables used in this research are GRDP, average years of schooling, and life expectancy. On HDI, previous research used several different variables. This research aims to determine economic growth, average length of education, and life expectancy for Regency/City HDI in Central Sulawesi Province.

Life Expectancy (UHH) at birth is among the statistical indicators that describe health sector development. This indicator is one of the components for calculating HDI. In 2022, Central Sulawesi's UHH will reach 68.93 years, meaning that the age of a baby born in 2022 means the baby is expected to live up to 69 years, which is still below the national figure (71.85). Newborn babies can live at 68.93 years, an increase of 0.1 years compared to the previous year. Children aged 7 years can attend school for 13.32 years, an increase of 0.09 compared to 2021.

Statistics that describe development in the education sector can be seen from the Expected Years of Schooling (HRL) and Average Years of Schooling (RRLS) indicators. Central Sulawesi's RLS reached 8.89 years (above the national figure of 8.69), meaning that, on average, the population of Central Sulawesi has been in school for around 9 years or the equivalent of grade 3 of junior high school. Meanwhile, RLS, spatially, only 4 regencies/cities are above the figure for Central Sulawesi, namely Palu City at 11.73 years, followed by Poso Regency at 9.52 years, Morowali Regency at 9.35 years and Buol Regency at 9.08 years. Meanwhile, residents aged 25 years and over have studied for 8.89 years on average. Education indicators in Central Sulawesi from year to year show quite good development, the RRLS rate in Central Sulawesi reaches 8.29 years. This indicator is a component that forms the Human Development Index for the education dimension. The RRLS figure is quite good. This figure is higher than the national figure of 8.10

GRDP is the amount of added value produced by all business units in a particular country or the total value of final goods and services produced by all economic units. Gross Regional Domestic Product (GRDP) indicates a region's economic growth. The GRDP indicator measures economic growth because it is not affected by the inflation rate and only represents the amount of additional production. Hence, it is more appropriate to describe real economic growth.

Central Sulawesi Province is one of the provinces whose economic growth rate fluctuated during 2017-2022. 2018 the growth reached 20.56 percent and decreased from 2.83 percent in 2019 to 4.86 in 2020. In 2021, it increased by 11.70 percent; in 2022, it increased by 15.17 percent. This means that the Central Sulawesi economy in 2022 will experience high and positive growth compared to the previous year.

Based publication of BPS, it can be seen that Central Sulawesi Province consists of 13 districts/cities with varying levels of economic growth. North Morowali district has the highest economic growth and continues to increase from 2017 - 2022 above 5 percent. Meanwhile, the 12 Banggai Islands (Bangkep) districts had the lowest and most fluctuating economic growth from 2018-2021, then increased in 2022 by 4.37 percent. Judging from 2022, almost all regencies/cities in Central Sulawesi Province will experience increased economic growth. This means that the economy of Central Sulawesi in 2022 will experience very high and positive growth compared to the previous year. Economic growth is a process, not a picture of the economy at one time. Still, we see the dynamic aspect of an economy, namely, seeing how an economy develops or changes over time.

2. RESEARCH METHODS

This type of research uses quantitative description. This descriptive quantitative research is useful for describing and testing a social phenomenon by calculating data where the discussion in this research depends on the results shown from the estimated data used. This type of research was chosen to analyze PDRB, Average Years of Schooling, and Life Expectancy on HDI in Districts/Cities in Central Sulawesi Province.

Data collection was carried out using documentation techniques. The data used is panel data. Data is collected online from a third party via the Central Sulawesi Central Statistics Agency (BPS) website. And processed based on research interests.

The method used to determine the influence of GRDP, Average Years of Schooling, and Life Expectancy on HDI is descriptive and panel data analysis. Panel data is a combination of *time series* and *cross-section*. Next, the data is processed using the *Eviews 9 software application* as a research tool. The general specifications for the panel data regression model for this research are as follows:

 $Yit = a + \beta_1 X_{1PDRB} + \beta_2 X_{2RRLS} + \beta_3 X_{3UHH} + e$

Information :

Y	= HDI
i	= Cross-section data "Central Sulawesi Province"
t	= Time Series Data 2017 - 2022
а	= Constant
$\beta_1\beta_2\beta_3$	= Regression Coefficient
X_1	= GRDP
X_2	= Average Years of Schooling (RRLS)
$\tilde{X_3}$	= Life Expectancy (UHH)
-	

= Term Error

In panel data regression analysis, three models are used: Common Effect, Fixed Effect and Random Effect. To determine the best model selection in panel data regression using 3 tests, i.e., *Chow* Test, *Test Hausman* and LM Test. And the hypothesis tests used include the t-test and F test, and use the coefficient of determination (R2).

3. RESULTS AND DISCUSSION

The following are the results of panel data testing used to determine the relationship between the independent variable and the dependent variable, namely GRDP, Average Years of Schooling, and Life Expectancy on HDI in Central Sulawesi Province 2017-202 2 using three approaches, namely *Common Effect Model, Fixed Effect Model,* and *Random Effect* Model.

Table 1. Processed Common Effect Model Results				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
С	0.352657	0.032592	10.82026	0.0000
X_1	-0.004444	0.000800	5.553007	0.0000
X_2	-0.179806	0.000256	702.9783	0.0000
<i>X</i> ₃	1.008061	0.000560	1800,533	0.0000

Source: Processed data using Eviews 9

In the Common Effect Model panel data regression testing, it can be seen that the Common Effect Model equation is as follows:

HDI = 0.352657 -0.004444 (GRDP) 0.179806 (RRLS) + 1.008061 (UHH) + ei

Variable	Coefficient	Std. Error	t-Statistics	Prob.
С	0.352657	0.035351	9.975789	0.0000
X_1	-0.004444	0.0008698	-5.118698	0.0001
X_2	-0.179806	0.000277	-648.1140	0.0000
$\overline{X_3}$	1.008061	0.000607	1660.010	0.0000

Source: Processed data using Eviews 9

In the Fixed Effect Model panel data regression testing, it can be seen that the Fixed Effect Model equation is as follows:

HDI = 0.352657 - 0.004444 (GRDP) - 0.179806 (RRLS) + 1.00806 (UHH) + eit

Tabi	Table 5. Results of Frocessed Random Effect Model					
Variable	Coefficient	Std. Error	t-Statistics	Prob.		
С	0.352657	0.635351	9.975789	0.0000		
X_1	-0.004444	0.000868	-5.118698	0.0001		
<i>X</i> ₂	-0.179806	0.000277	-648.1140	0.0000		
<i>X</i> ₃	1.008061	0.000607	1660.010	0.0000		
Source: Processed data using Eviews 9						

Table 3. Results of F	Processed	Random	Effect Model
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Source: Processed data using Eviews 9

Random Effect Model panel data regression test, it can be seen that the Random Effect Model equation is as follows:

HDI = 0.352657 - 0.004444 (GRDP) - 0.179806 (RRLS) + 1.00806 (UHH) + eit

In determining the selection of the best model between the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) is to carry out the Chow Test, Hausman Test, and Breusch-Pagan LM Test.

Table 4. Model Selection Results Using Chow Test					
Effects Test		Statistics	df	Prob.	
Cross-section	n F	0.000000	(3.17)	1,0000	
Chi-square	cross-	0.000000	3	1,0000	
section					
O		ata	^		

Source: Processed data using Eviews 9

Hypothesis:

 H_a : Common Effect Model (CEM) is more appropriate

 H_0 : Fixed Effect Model (FEM) is more precise

Chow test results in Table 4 above, it is known that the probability value is 0.0000. because the probability value is 1.0000 < 0.05, so it is H_0 rejected and H_a Accepted. So the estimation model used is the Fixed Effect Model (FEM).

Ta	Fable 5. Model Selection Results Using the Hausman Test					
	Test Sum	mary	Chi-Sq. Statistics	Chi-Sq. df	Prob.	
	Random	cross-	0.000000	3	1,0000	

Source: Processed data using Eviews 9

Hypothesis:

 H_a : Random Effect Model (REM) is more appropriate

 H_0 : Fixed Effect Model (FEM) is more precise

Hausman test results in Table 5 above, it is known that the probability value is 1.00 00. because the probability value is 1.00 00 < 0.05, so it H_0 is rejected and H_a Accepted. So, the estimated model used is *the Fixed Effect Model* (REM)

Table 6. Model Selection Results With Test L.M				
Breusch-Pagan 2.400000 36,00000 38.40000				
	(0.1213)	(0.0000)	(0.0000)	

Source: Processed data using Eviews 9

Hypothesis:

 H_a : Fixed Effect Model (FEM) is more precise

 H_0 : Random Effect Model (FEM) is more precise

It is known that the Breusch-Pagan Cross-Section Prob value is 0.1213. This shows that the value is smaller than $\propto = 0.05$, so it was decided to H_0 rejected. In other words, the Random Effect (RE) model is more appropriate. Based on the Chow, Hausman, and LM tests above, the best model chosen is the Random Effect (RE) model for the Hausaman and LM tests, while the Chow test chooses the Common Effect (CE) model. The following are the results of processing using Random Effect (RE):

 Table 7. Model Selection Results Using Random Effect Test

Variable	Coefficient	Prob.
С	0.352657	0.0000
X_1	-0.004444	0.0001
X_2	-0.179806	0.0000
X_3	1.008061	0.0000
R-Square		0.999999
Adjusted R-Square		0.999999
F-Statistics		5781175
Prob (F-Statistic)		0.000000

Source: Processed data using Eviews 9

Based on the Chow and Hausman test results, the best model in this research is *the Random Effect Model. With the following equation:*

HDI = 0.352657 - 0.004444 (GRDP) - 0.179806 (RRLS) + 1.008061 (UHH)

Based on results testing, Which has been outlined with the use of model regression linear multiple on data panel with model random effect show that results variable GRDP influential negative And significant to human development index. Every time GDP increases by 1%, it will decrease by -0.004444. It means variable GRDP has a connection Which neither unidirectional nor inversely proportional with the human development index. That is, when GRDP increased, the human development index decreased. This matters because the GRDP output Regency/City in Province Central Sulawesi is not optimal. With an increase in GRDP district/city in Province Sulawesi, Middle output experienced a decline.

The results of this research are in line with research conducted by (Muhamad & Rahmi, 2023), where the results of this research show that the Central Sulawesi Provincial Government is expected to be able to strengthen the conditions of internal economic factors, which will later be able to increase government spending through routine spending and development spending. In the future, the aim is to develop physical and non-physical capital to improve the GRDP of Central Sulawesi Province.

Based on the results testing, Which has been outlined with the use of model regression linear multiple on data panel with model random effect show that results variable average length of school influential negative And significant to human development index. Every time the workforce increases by 1%, it will decrease by -0.179806. It means variable Average Years of Schooling have a connection opposite to the human development index. That is. The higher the average length of schooling, the lower the human development index because the Average Years of Schooling in Regency/City in Province Central Sulawesi is not yet optimal and lacks guality or expertise Average Years of Schooling Which There is, with increase Average Years of Schooling, then HDI experiences decline. Statistics that describe development in the education sector are seen from the Expected Years of Schooling (HRL) and Average Years of Schooling (RRLS) indicators. Central Sulawesi's RLS reached 8.89 years (above the national figure of 8.69), meaning that, on average, the population of Central Sulawesi has been in school for around 9 years or the equivalent of grade 3 of junior high school. Meanwhile, RLS, spatially, only 4 regencies/cities are above the figure for Central Sulawesi, namely Palu City at 11.73, followed by Poso Regency at 9.52, Morowali Regency at 9.35 and Buol Regency at 9.08. Meanwhile, residents aged 25 years and over have studied for 8.89 years on average.

The results of this research are in line with research conducted by (Alfarez et al., 2023) that the measurement of the human development index can be seen in terms of life expectancy, expected length of schooling, average length of education, and per capita expenditure which results together significant influence on human development. Thus, the average size of education in Central Sulawesi to overcome this problem requires a holistic and integrated approach involving the government, community, and various other stakeholders, both in education, providing financial assistance to poor families and improving the quality of educational infrastructure. , as well as efforts to prevent and mitigate conflicts and disasters.

In Central Sulawesi, the decrease in the average length of schooling could be caused by several factors specific to the region, such as:

- a) Economic Conditions: Economic fluctuations or changes in income distribution can affect a family's ability to finance their children's education. Families may be more likely to prioritize basic needs over educational costs if a significant economic downturn is expected.
- b) Social Instability: Conflict between communities or between groups, as well as significant social changes, such as migration or urbanization, can disrupt the continuity of education for students in the region.
- c) Lack of Investment in Education: If there is a lack of investment in the education sector, either from the government or the private sector, this can affect the availability of educational facilities, the quality of teachers, and educational opportunities for students.
- d) Changes in Educational Policies: Such as changes to the curriculum, examination system, or educational incentive programs, can have a significant impact on student participation and retention in school.
- e) Natural Disasters: If the area has experienced a natural disaster in the last six years, such as an earthquake, flood, or landslide, this can damage school infrastructure and disrupt the teaching and learning process.
- f) Limited Access: Accessibility problems to schools, especially in inland or remote areas, may be an important factor in the decline in average years of schooling. Long distances, lack of transportation, or poor infrastructure conditions can make it difficult for students to stay in school.

Based on the results testing outlined with the use of model regression linear multiple on data panel with The random effect model shows that the variable results are life expectancy influential positive And significant human development index. Every increase in life expectancy life influential by as big as 1%. It will increase as big as 1.008061. With say other, If variable As life expectancy increases, the human development index variable also increases.

Regency/City in Province Sulawesi Middle, specifically on the aspect of Life expectancy, can drive the human development index because the life expectancy district/city in Province Sulawesi Middle can significantly increase the district/city human development index in Central Province. The

results of this research align with research conducted by (Manurung, 2021) (Ginting & Lubis, 2023), where the results show that the health sector has a positive and significant effect on the human development index. Because health is very important in human life and good quality health will encourage a high increase in productivity, to improve the quality of health, a driving factor for increasing health standards itself is needed. Life expectancy significantly and positively influences the Human Development Index (HDI). Life expectancy is an estimate of the average age that can be achieved by individuals in a population at the time of birth or in a certain period. Increasing life expectancy contributes to increasing HDI through several mechanisms. The following is an explanation of the positive relationship between life expectancy and HDI:

- a) Health: Higher life expectancy is usually associated with improved health and reduced mortality. Life-threatening diseases, such as communicable and non-communicable diseases, can significantly impact a region's quality of life and mortality rates. Increased life expectancy increases access to health care, vaccinations, better sanitation, and knowledge about healthy lifestyles.
- b) Social Development: Higher life expectancy is also related to increasing levels of education and knowledge in an area. Higher education can provide a better understanding of health, sanitation, nutrition, and self-care. Apart from that, higher life expectancy can also have a positive impact on people's participation in social, economic, and political activities.
- c) Quality of Life: A higher life expectancy means individuals have more opportunities to experience and enjoy various aspects of life, such as family, work, recreation, and social contribution. This contributes to improving the overall quality of life.

Hypothesis testing is carried out to determine whether there is an influence or not in a relationship between two variables, namely the *dependent variable* and the *independent variable*. Hypothesis testing will be carried out: simultaneous influence testing (F-test), partial influence testing (T-test), and analysis of the coefficient of determination.

Table 8. F-Statistics Test Results			
R-Square	0.999999		
Adjusted R-Square	0.999999		
F-Statistics	5781175		
Prob (F-Statistic)	0.000000		

Source: Processed data using Eviews 9

Based on the table above, it can be seen that the f-statistic value obtained is 5781175 with a value of df1 (k-1)= (4-1)=3, df2 (nk)=(78-4)=74, and a significance level of <0, 05. The degree of freedom value was 2.495, F-statistic (5781175) > f-table (2.495). So, it can be concluded that we accept H_a and reject H_0 . Meanwhile, the F-statistic probability value is 0.000000. this value is smaller than $\propto = 5\%$ or (0.05), so it can be decided to reject H_0 . Therefore, it can be concluded that the GRDP, Average Years of Schooling, and Life Expectancy variables influence the HDI variable.

Table 9. Random Effect Model (RE)					
Variable	Coefficient	Prob.			
С	0.352657	0.0000			
X_1	-0.004444	0.0001			
<i>X</i> ₂	-0.179806	0.0000			
<i>X</i> ₃	1.008061	0.0000			

Source: Processed data using Eviews 9

Based on the economic growth variable (X_1), based on the table above, It can be seen that the t-statistic value is -5.118698 with the df value (n- k)= (78 -4)= 74, so the df value is 1.6 66, the t-statistic is (-5.118698) > t-table (1.6 66). Meanwhile, the Prob t value is 0.0001. That value is smaller than $\alpha = 5\%$ or (0.05), so it is decided to reject H_0 and accept H_a . Therefore, Economic Growth has a negative and significant effect on HDI.

Meanwhile, the variable average length of school (X_2), based on the table above can be It is known that the t-statistic value is - 648.1140 with a df value (n- k)= (78 -4)= 74, so the df value is 1.6 66, the t-statistic is (- 648.1140) > t-table (1.6 66). Meanwhile, the Prob t value is 0.0000. This value is smaller than $\alpha = 5\%$ or (0.05), so it is decided to reject H_0 and accept H_a . Therefore, this means that the average length of schooling has a negative and significant effect on HDI.

For the life expectancy variable (X_3), based on the table above, you can It is known that the t-statistic value is 1660.010 with a df value (nk) = (78 - 4) = 74, so the df value is 1.6 66, the t-statistic is (1660.010) > t-table (1.6 66). Meanwhile, the Prob t value is 0.0000. The value is smaller than $\alpha = 5\%$ or (0.05), so it is decided to reject H_0 and accept H_a . Therefore, the Human Development Index positively and significantly affects HDI.

Table 10. R-Square Test Results		
R-Square	0.999999	
Adjusted R-Square	0.999999	
F-Statistics	5781175	
Prob (F-Statistic)	0.000000	
.		

Source: Processed data using Eviews 9

Based on Table 10 of the *Random Effect Model* (REM) regression results, an R-square value of 0.999999 or 99% is obtained, meaning that the diversity of HDI variables can be explained by the Economic Growth variable, Average Years of Schooling and Life Expectancy of 99% while the remainder is 1 % explained by other variables outside the model studied.

4. CONCLUSION

Based on the research results above, it can be concluded that the influence of economic growth variables, average years of schooling, and life expectancy on HDI in districts/cities in Central Sulawesi Province in 2017-2022 is as follows. The results of the economic growth variable have a negative and significant effect on HDI in districts/cities in Central Sulawesi Province in 2017-2022. It means If economic growth increases, the HDI variable will decrease. The results of the variable average length of schooling have a negative and significant effect on economic growth in districts/cities in Central Sulawesi Province in 2017-2022. This means that if the variable average length of schooling increases, the HDI variable decreases. The results of the life expectancy variable have a positive and significant effect on HDI in districts/cities in Central Sulawesi Province in 2017-2022. This means the HDI variable will also increase if the life expectancy variable increases.

Acknowledgements

I want to thank the presence of Allah SWT for all His blessings and gifts, which have given me the knowledge, experience, and opportunities for me as a researcher to complete this article. So, on this occasion, I would also like to thank the Faculty of Economics and Business at Tadulako University, which has been instrumental in providing resources for me to continue my undergraduate studies in the Economics and Development Studies Study Program. A big thank you to my parents, the Dean of the Faculty of Economics and Business as well as the Head of the Department of Economics and Development Studies

Thank Mrs. Santi Yunus, my esteemed Final Assignment Supervisor and lecturer, for all her support, guidance, and direction. Apart from that, I would like to thank the lecturers for their encouragement, advice, and invaluable assistance while conducting this research. Thank you to Mr. Yunus Sading, Failur Rahman, and Mr. Andi Herman Jaya who have been extraordinary mentors during the writing of the final assignment. Lastly, I would also like to thank everyone who has supported me emotionally and intellectually while writing this final thesis.

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