

**SHORT AND LONG-TERM IMPACT OF EDUCATIONAL
ENROLLMENT RATES ON ECONOMIC GROWTH:
FOR INDONESIA'S SUSTAINABLE DEVELOPMENT OF
HUMAN CAPITAL**

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Abstract

This research explores the relationship between Indonesia's economic growth and school participation rates. Using the ARDL model and Bounds test cointegration method, the study examines this relationship and finds that investing more in education, particularly at higher levels, can contribute to long-term economic growth. The study emphasizes the role of education in shaping human resources and promoting sustainable economic development. It suggests that increased investment in education can create a stronger pool of skilled workers, leading to economic growth. The research also reveals a temporary increase in employment as a result of education-driven growth, contributing to the sustainable development of human resources. The study highlights the importance of education funding in nurturing human capital and advocates for policy interventions that prioritize education as a driver of Indonesia's long-term development goals. Overall, this study emphasizes the transformative potential of investing in human capital for Indonesia's economy. In conclusion, this study sheds light on the relationship between economic growth and education, emphasizing the transformative potential of investing in human capital for the sustainable development of Indonesia's economy.

Keywords: ARDL Model, Economic Growth, Education, Human Resources

1. INTRODUCTION

In his book Becker, (2018) The article "Human Capital" contends that when there is a shortage of natural resources, education can help increase national production by helping to create human resources through high-quality labor. Indonesia keeps funding initiatives that can promote the development of human resources, such as macroeconomic budgetary allotments for education development and individual education investments, both at the corporate and governmental levels. (Syamsuddin et al., 2021) .

The early childhood education program and 12 year compulsory education are programs designed to reduce illiteracy rates in Indonesia. Increasing the percentage of the population participating in elementary, intermediate, and postsecondary education programs across the nation in an equitable manner is one of the program's objectives. The government expects the SM/equivalent GER indicator at the province level to achieve level 95, in line with the Ministry of Education and Culture's Strategic Plan for 2020–2024.

Figure 1 illustrates how the natural growth rate of participation varies and exhibits a linear growth pattern across all educational levels. This demonstrates that annual fluctuations in educational participation rates result in an increase.

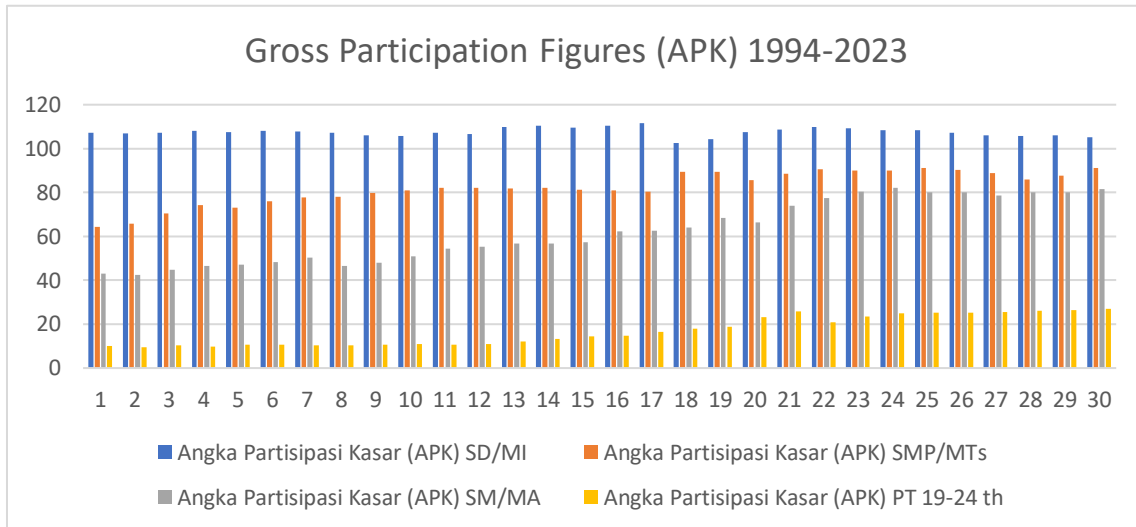


Figure 1. Gross Participation Rate (APK)

Budgetary allocations are another way that the government supports the advancement of education. to produce human resources that are competitive, excellent, inventive, and honest. Figure 2 illustrates how the spending for education increased annually between 2014 and 2022.

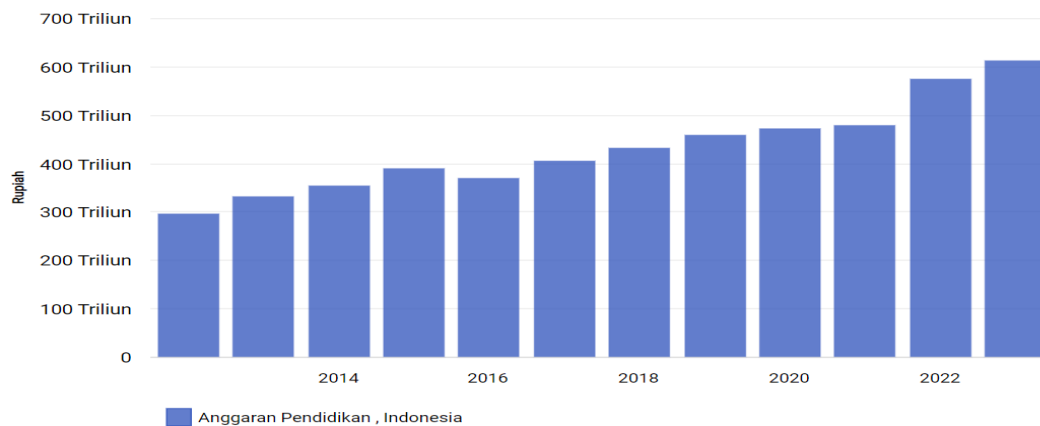


Figure 2. Education Budget, Indonesia

Based on the educational hierarchy of expected advantages, It is projected that investments in education will yield benefits in terms of growth and development cumulatively. The projected rate of return to growth through secondary education is higher than that of pre-primary and primary education in light of these expectations. It is also anticipated that results from higher education will surpass those from secondary education. Nevertheless, despite the fact that a number of studies have discovered a beneficial and sustained correlation between education and growth by Adejumo et al., (2021) and Odeleye (2017) in Nigeria, other studies such as study Adawo, (2019) demonstrate that while lower education levels foster growth, higher and middle education

do the opposite. In the interim, research conducted by Omojimate, (2015) did not discover a link between economic development, capital spending, or the enrollment rates of elementary and middle schools. And research conducted by Lutfy et al., (2019) says secondary education has an effect in the short term, but not basic or higher education. and just Higher education has an effect on long-term growth.

In order to overcome development obstacles, it is necessary to determine whether variations in educational participation levels (as a gauge of human capital) have distinct effects on growth or how much education affects economic growth in general. Even if endogenous growth theory suggests that education is crucial for the development of human resources, what matters more is how education via growth can result in the production of sustainable human resources.

This encourages scholars to investigate more than only the connection between growth and education. It is possible to place employment outcomes more accurately within growth theory by merging education and growth. Thus, by extending the analysis of the education-growth relationship, we may investigate how education can impact growth in terms of enhancing livelihoods through job creation or unemployment reduction. In light of this, the study looks at the dynamics of input and output in the relationships that exist between growth and educational involvement in Indonesia, as well as the relationship between education (i.e., degree of school participation) and economic growth.

The structure of further research is as follows. Literature on theory and empirical aspects, part two. The data and technique are explained in Sections 3 and 4, and findings and implications are provided in Section 5.

2. LITERATURE REVIEW

2.1. Theoretical Review

In his book Solow (1956) created a model of exogenous growth that says that, in addition to labor and capital, which are input elements, technological advancements (technology) also contribute to growth. Meanwhile Mankiw et al., (1992) created the Solow model by adding human capital as an input source for growth. In addition, educational investment is cited by the new growth theory as a crucial component of building human resources for growth (Lucas, 1988) ; (P. Romer, 1990) ; (Weinhold & Rauch, 1999) ; (Grossman & Helpman, 1990) ; (Rivera-Batiz & Romer, 1994) .

The dual economy's endogenous growth model postulates that wealthy people generate growth through teaching the underprivileged in addition to devoting all of their labor time to their own creation and knowledge-gathering. The term endogenous growth model of a dual economy here refers to a theoretical framework that investigates how economic growth can be produced internally in a context that has two sectors, all the while educating the underprivileged. demonstrates how the education or training of the underprivileged is seen as a crucial component. in attaining growth in the economy (Gupta & Chakraborty, 2006) .

According to the Human Capital Theory, spending on education are made with the expectation of higher returns or value in the future. Since knowledge is an incomparable good and tends to boost profits, a number of earlier research found that the more training or longer a person learns, the more benefits they will receive later on (Barro & Lee, 1994) ; (PM Romer, 1986) ; (Benhabib & Spiegel, 1994) (W. McMahon, 2016) .

The growth literature has addressed education in relation to employment, productivity, and growth in great detail. Specifically, an innovation-based growth model is emphasized by endogenous growth theory. Model developed by Romer, (1990), who postulated factors of growth, including capital, labor (unskilled labor), additional additions to human capital (calculated based on years of education), and fresh concepts (innovation), and who expressed total productivity in relation to the level of product variety. Romer's investigation of research and development led to the judgment that levels of human resources play a part of sustained growth, which is how he contributed to the endogenous growth model. The fundamental premise is that human resources are an essential component throughout the process of creation and development of new concepts. In particular, the endogenous model asserts that internal human resource activities—rather than outside influences—are the cause of economic growth. As a result, the development of human resources is now an innate process that promotes productivity and growth. Thus, knowledge's contribution to the development of human resources for growth realization forms the core of endogenous growth theory.

Education continues to be a crucial conduit for economic development even while additional facets of human capital, including capacities and health, have varying effects on economic progress. Consequently, while education by itself is obviously insufficient to address global issues, it does play an important part in generating and promoting development solutions.

Based on new growth theory models, it can be deduced that a major factor is education in the generation of novel concepts, and that this mechanism fosters creativity and appreciation, which in turn generates new employment prospects. Therefore, for high value-added knowledge economies, according to endogenous growth theory, both externalities that are positive and negative effects on development, including long-term growth.

2.2. Empirical Review

The connection between human resources, education, and growth in empirical research is still up for debate. Drawing from the compilation of multiple studies presented in Table 1 about the ways in which different educational attainment levels impact global growth. Despite disagreement, some of these results have helped shape policies for economic expansion in a number of global economies. Beyond economic growth, however, there are a number of basic employment-related concerns that could raise doubts about the value or advantages of pursuing the growth and enduring quality education that is the focus of this research.

Through the impact throughout time, more basic concerns can be identified in evaluating the impact of educational growth in development (human capital) for sustainable development. Research conducted by Nazneen Ahmad & Joseph J. French, (2018) The horizon problem is a concern in the study of human capital and economic progress having to do with an emerging market. This idea originates from the outcomes of educational investments that address development challenges such as unemployment, low income levels, and productivity and offer timely returns over the long run as well as the immediate term. Nazneen Ahmad & Joseph J. French, (2018) make the case that, rather than just focusing resources on higher education, emerging economies should consider alternative investment options that can yield rapid returns and address

development challenges. This is in addition to allocating some funds to basic or minimum education.

Research results of Nazneen Ahmad & Joseph J. French, (2018) have the same view as Krueger et al., (2000) that the consequences of education fade in later phases of development, particularly in underdeveloped nations. arguing that minimum education for the unskilled and uneducated will have a higher positive and multiplier impact on enhancing productivity given the significant population growth in emerging countries. They contend that, as a result, the advancements brought about by giving illiterate people a basic education will be equivalent to the outcomes anticipated from higher education, particularly with regard to innovation and productivity in industrialized nations. When everything is said and done, these arguments highlight the importance of basic education in addressing the issues of unemployment and development in developing countries. In addition, they contend that the labor force can swiftly generate positions with less education, which will lower the rise in unemployment rates, particularly for higher education levels a phenomenon known as graduate unemployment. The question is, to what degree can sustainable educational involvement boost employment or lessen the burden of unemployment in emerging nations like Indonesia, taking into account the basic viewpoint of the literature currently in publication.

Table 1. Literature Related to the Relationship Between Education and Economic Growth

Writer	Research focus	Research result
(Liu & Armer, 1993)	Taiwan	Growth is impacted by elementary education , secondary education, but not by upper secondary and postsecondary education.
(Barro & Lee, 1994)	129 Countries	a favorable correlation between growth and education
(Tallman & Wang, 1994)	Taiwan	The influence of higher education is larger than that of primary and secondary education.
(Benhabib & Spiegel, 1994)	<i>Cross country</i>	a favorable correlation between growth and education
(Mingat & Tan, 1998)	113 Countries	Depending on a nation's economic development level, education has different effects. In affluent nations, higher education is beneficial; in developing nations, secondary education is beneficial; and in less developed nations, primary education is beneficial.
(Gemzell, 1996)	OECD countries	The majority of less developed countries are impacted by primary education, whereas affluent countries are more affected by secondary and higher education.
(W.W. McMahon, 1998)	Asian countries	Advanced learning has a detrimental effect on economic growth, because of the high price of tertiary education, the mismatch between labor market demand and acquired skills, and the oversupply of educated workers relative to the demand in the market. however, the benefits of primary and secondary education are substantial.
(Bils & Klenow, 2000)	<i>Cross country</i>	education and economic growth cannot be explained by any particular channel or mechanism in significant proportions. This indicates that while there is a

		connection between economic growth and education, other factors outside the education channel cannot be ignored and have a significant contribution in explaining this relationship.
(Abbas, 2001)	Pakistan and Sri Lanka	Growth is negatively impacted by primary education, but growth is positively impacted by secondary and higher education in both nations.
(Asteriou & Agiomirgianakis, 2001)	Greece	Growth is positively impacted by rising primary, secondary, and tertiary school enrolment rates.
(Petrakis & Stamatakis, 2002)	Low and Middle Income Countries	The impact of education on growth is contingent upon the economic development of a nation. Higher education is beneficial for high-income developed countries, while primary and secondary education is beneficial for low-income ones.
(Self & Grabowski, 2004)	India	Primary and secondary education has a causal influence on economic growth
(Bratti et al., 2004)	<i>Cross country</i>	Education, both primary and secondary, increases productivity.
(Haouas & Yagoubi, 2005)	MENA countries	On average, human capital has a significant effect on growth but has no effect on productivity growth
(Park, 2006)	94 Developed and Developing Countries	Productivity growth is positively impacted by the degree of educational attainment (human capital).
(Lin, 2006)	Taiwan	Economic growth is positively impacted by primary, secondary, and higher education. GDP per capita and education expenditures are causally correlated.
(Francis & Iyare, 2006)	Caribbean- Barbados, Jamaica, Trinidad and Tobago	<p>The results of these countries' educational systems and economic expansion vary.</p> <p>In the near term, for Jamaica, bi-directional refers to a two-way or mutually reinforcing relationship between economic growth and education.</p> <p>There is no obvious direction of causality between education and economic growth in Barbados and Trinidad and Tobago, which is known as neutral causality in the short or long run. This indicates that changes in education levels, either in the short or long term, do not significantly predict or are predicted by changes in economic growth.</p> <p>A significant link has been shown between the per capita expenditure on education and the gross national income (GNI) of nations with greater per capita GNI. In other words, nations with higher GNI per capita typically devote more resources to education per person.</p>
(CHI, 2008)	China	When it comes to growth, higher education is far more beneficial than primary and intermediate school.

(Pereira & St. Aubyn, 2009)	Portugal	The GDP is positively impacted by primary and secondary education, but slightly negatively by advanced education.
(Loening et al., 2020)	Guatemala	Compared to secondary and higher education, primary education promotes growth.
(Lutfy et al., 2019)	Malaysia	Compared to basic and higher education, secondary school has a substantial and beneficial short-term influence. Only a college degree has a long-term, beneficial, and considerable impact on growth.
(Nazneen Ahmad & Joseph J. French, 2018)	Bangladesh	there is statistical proof that the rise of the GDP has an impact on the human capital pool. When analyzing Granger causality. Acquired via education and training, knowledge, skills, and human productive ability comprise the stock of human capital. It may be viewed as a measure of the amount invested in human capital. The impact of innovation (renewal or change) in the secondary school system is demonstrated by innovations in secondary education. These innovations could include adjustments to the secondary education curriculum, instructional strategies, educational technology, or other educational policy. Economic growth is facilitated by such improvements in secondary education.
(Adelakun, 2019)	Nigeria	Enrollment in elementary, secondary, and university education is a key component of human capital, which is closely linked to economic growth.
(Pegkas, 2020)	Greece	Growth is positively impacted by secondary and higher education, but basic education has little effect on education
(Adejumo et al., 2021)	Nigeria	According to the study, spending on education, particularly at the higher education level, boosts employment in the near term and has a beneficial effect on economic growth over the long run.
(Hota, 2023)	India	Economic growth benefits from investments in education. Infrastructure spending by the government in the areas of communications, education, health, and transportation promotes economic growth.

Source: Processed data (2023)

3. RESEARCH METHODS

This study is based on the new growth theory (NGT), which contends that the advantages of improving human resources such as skills, knowledge acquisition, and health—strengthen endogenous growth and productivity in a nation. (P. Romer, 1990) . According to the developed hypothesis, there is a dynamic relationship between Indonesia's economic growth and school participation rates, drawing on earlier research by (Adejumo et al., 2021) . Secondary data for Indonesia from 1990 to 2022 is used in the study. Research data is sourced from the World Bank. To ascertain the short- and

long-term associations between independent and dependent variables, data processing is done.

Growth in the economy is measured by (GDP), Participation in primary education is indicated by (PD), Participation in secondary education is indicated by (PM) Your involvement in tertiary education is indicated by (PA), and includes the population growth control variable, indicated by (GP). using empirical analysis to examine short and long term balancing relationships using the ARDL model and the Bounds test cointegration technique. The references and definitions among the variables under analysis are listed in Table 1.

Table 1. Definitions and sources of variables

Variable	Notation	Data source
Economic growth	GDP	worldbank
Primary	PD	worldbank
secondary	PM	worldbank
tertiary	P.A	worldbank
Population growth	GP	worldbank

Source : processed data

3.1. Data Analysis

Employing the Autoregressive Distributed Lag (ARDL) econometric model, referred to as a dynamic model since it explains how the dependent variable varies over time in proportion to its value in the preceding period. The ARDL approach combines the use of Autoregressive (AR) and Distributed Lag (DL) methodologies. The lag indicates how long the model is used to forecast potential values. The DL technique is a methodology that utilizes both current and historical data from the independent variable, if the AR method uses data from the independent variable from prior periods. The ARDL model explains variations in the short and long term effects of factors.

3.1.1. Estimate Auto-regressive Distributed Lag (ARDL) Model

The following equation represents the ARDL model as a whole:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^n \beta_1 \Delta Y_{t-1} + \sum_{i=1}^n \beta_2 \Delta X_{t-1} + \varphi_1 y_{t-1} + \varphi_2 x_{t-1} + \mu_t$$

Where

β_1, β_2 = Short term coefficient

φ_1, φ_2 = Long-term coefficient

The capacity to recognize the dynamics of the short- and long-term influence of study variables is a benefit of the ARDL analysis paradigm. The formulation of the more comprehensive short-term relationship equation for the ARDL model that was previously discussed looks like this:

$$\sum_{i=1}^n \beta_1 \Delta Y_{t-1} + \sum_{i=1}^n \beta_2 \Delta X_{t-1}$$

With long-term relationship equations:

$$\varphi_1 y_{t-1} + \varphi_2 x_{t-1}$$

so, the ARDL equation is:

$$\begin{aligned} \Delta PDB_t = & \beta_0 + \beta_1 \sum_{i=1}^n \Delta PDB_{t-1} + \beta_2 \sum_{i=1}^n \Delta PD_{t-1} + \beta_3 \sum_{i=1}^n \Delta PM_{t-1} \\ & + \beta_4 \sum_{i=1}^n \Delta PT_{t-1} + \beta_5 \sum_{i=1}^n \Delta GP_{t-1} \\ & + \beta_6 \sum_{i=1}^n \Delta PD_t + \beta_7 \sum_{i=1}^n \Delta PM_t + \beta_8 \sum_{i=1}^n \Delta PT_t + \beta_9 \sum_{i=1}^n \Delta GP_t + \varepsilon_t \end{aligned}$$

Where:

β_0 = constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, = regression coefficient for the variables in the researcher's short-term model

$\beta_6, \beta_7, \beta_8, \beta_9$, = regression coefficient for the long-term variable in the researcher's model

Δ = the difference between the values of two variables over consecutive time intervals

ε_t = value error

3.1.2. Classic assumption test

To ensure that the estimated parameters and regression coefficients are not biased, it is necessary to test the classical assumptions. Includes heteroscedasticity, autocorrelation, multicollinearity and normality test.

4. RESULTS AND DISCUSSION

4.1. Research Results

One criteria for ARDL modeling was met by conducting the stationary test. The Augmented Dickey Fuller Test (ADF) unit root test is used for this. When data are non-stationary, spurious regression will occur. The outcomes of the data stationarity test for each variable are listed below.

Table 2. Stationarity Test	
Variable	P-Value
GDP	0.0000
Primary	0.0000
Secondary	0.0000
Tertiary	0.0000
Pop Growth	0.0009

Table 2 displays all variables at the first degree of difference as stationary. So that further testing can be carried out.

Table 3. Residual Stationarity Test

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-4.165	-3.709	-2.983

MacKinnon approximate p-value for Z(t) = 0.0008

In table 3. Above the stationarity test of stationary residuals at level levels. So that further testing can be carried out.

Table 4. ECM Test

Source	SS	df	MS	Number of obs	=	31
Model	4.3110159	5	.86220318	F(5, 25)	=	3.29
Residual	6.54271958	25	.261708783	Prob > F	=	0.0202
				R-squared	=	0.3972
				Adj R-squared	=	0.2766
				Root MSE	=	.51157

D.y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
x1					
D1.	.0058004	.0093671	0.62	0.541	-.0134915 .0250923
x2					
D1.	.0046812	.004184	1.12	0.274	-.003936 .0132983
x3					
D1.	.1501676	.1023394	1.47	0.155	-.0606043 .3609396
x4					
D1.	.0937742	.0344877	2.72	0.012	.0227455 .1648029
ect					
L1.	-.3254574	.0957142	-3.40	0.002	-.5225845 -.1283303
_cons					
	-.0307914	.0995603	-0.31	0.760	-.2358396 .1742569

In table 4, is the ECM equation. The value for ect L1 is in the range 0 to -1, namely -0.3254574, which means it meets the value rules for the ECT variable, and the variable is stationary. This means that the short-term and long-term adjustment variables are significant with a value of $p>|t|$ $0.002 < 0.05$.

Table 5. ARDL test

D.y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ADJ					
Y					
L1.	-.3614935	.090563	-3.99	0.001	-.5498295 -.1731575
LR					
x1					
L1.	-.112923	.0434318	-2.60	0.017	-.2032444 -.0226017
x2					
L1.	.0404752	.0140083	2.89	0.009	.0113434 .069607
x3					
L1.	-.0437941	.1232027	-0.36	0.726	-.3000082 .21242
x4					
L1.	.3875558	.1005753	3.85	0.001	.178398 .5967137
SR					
x1					
D1.	-.0089503	.0112615	-0.79	0.436	-.0323698 .0144692
x2					
D1.	.0078914	.0044512	1.77	0.091	-.0013654 .0171483
x3					
D1.	.2081021	.0921773	2.26	0.035	.0164089 .3997953
x4					
D1.	.1087342	.0392105	2.77	0.011	.0271916 .1902768
_cons					
	1.053944	.4096753	2.57	0.018	.2019779 1.905911

In table 5, where the basic education variable has a negative relationship with economic growth in the long term (probability 5%) and has no relationship in the short term, the secondary education variable has a positive effect with economic growth in the short term (probability level 1%) and long term (probability 10%), and the tertiary education variable is related to the level of economic growth in the short term (probability 5%) and not in the long term, while the control variable population growth is positively related to the level of economic growth in the short term and long (1% and 5% probability levels).

4.2. Discussion

Previous research states that there is an influence between basic education level on economic growth (Self & Grabowski, 2018) and (Adelakun, 2019). Econometrically, it is found that the basic education variable is negatively related to long-term economic growth in Indonesia ($\text{sig} < 0.05$), meaning that a decrease in basic education participation will increase economic growth in the long term.

Based on the results of statistical tests, it is stated that secondary education has a positive relationship with long and short term economic growth in Indonesia, with P-values of 0.009 and 0.091 respectively at a 10% probability level, meaning that the higher the participation in secondary education, the higher the economic growth in Indonesia. both short term and long term. In line with research conducted by (Adejumo et al., 2021) and (Hota, 2023) which states that secondary education is related to increased economic growth. This finding further confirms secondary school participation as a benchmark for the average development of human resources in Indonesia. So, it is hoped that the education obtained from the Early Childhood Education Program and 12 Year Compulsory Education Program can help workers and prospective workers reduce unemployment thereby increasing economic growth in Indonesia.

Based on the results of statistical tests, it is stated that tertiary education in the short term has a positive relationship with economic growth with a P-value of 0.035 but does not have a long-term relationship with growth with a P-value of 0.726. in line with research conducted by (Abbas, 2015) and (Asteriou & Agiomirgianakis, 2011).

5. CONCLUSION

With the intention of making recommendations for Indonesia's sustainable human capital development, this study looked at the varying effects of various educational participation levels (as a metric of human capital) on growth rates in that country.

The results of this study show that long-term growth is negatively correlated with elementary school education, whereas growth is greatly increased both short- and long-term by secondary school education, which is a relevant metric of human capital. Similarly, growth and higher education have a strong short-term relationship. One such set of control factors to lessen estimate bias is population growth. increase in the short and long terms is favorably correlated with population increase.

These results lend support to the government's Early Childhood Education Program and 12-Year Compulsory Education Program in Indonesia, given that the country's secondary school enrollment rates have dramatically grown. Additionally, this study supports the new growth theory, often known as the endogenous model, which contends

that increasing education spending, particularly at greater participation rates, permits human capital to increase dynamically and contribute to Indonesia's long-term progress.

In the meantime, in order to achieve of Sustainable Development Goal Number 4 (SDG4), which include raising productivity, employment, and educational attainment as well as the realization of other SDGs, such as the reduction of poverty and inclusive growth, the primary task remains ensuring sustainable human development. Thus, secondary education involvement boosts growth both short- and long-term with the introduction of education-driven growth modulation.

The advantages of education in creating economic growth, however, appear to need integrating education with other mutually reinforcing factors like strong governance, the rise of the private sector, and the effective use of human resources in order to sustain human resources. Resources both physical and human special education and training, including technical and skill-oriented training, utilizing disruptive technologies, and generating employment possibilities through investment.

In the end, the researcher suggests that the government Look past the conventional what constitutes human resources in the context of education and improve the determinants of human resource development for the purpose of human resource development in Indonesia, all the while enhancing the current educational framework to raise school enrollment rates.

There is space for improvement in this analysis, particularly in terms of adding to the body of literature already in existence by evaluating how the study's findings endure empirical examination when placed inside the scope of other countries. This future research approach builds on the notion that the findings and related policy implications described in this study cannot be applied to other developing countries unless they are substantiated by a robust, nationally-specific empirical examination.

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