

The Role of Technology in Human Capital and Economic Growth in Indonesia

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ABSTRACT

The aim of this research is to investigate the direction of the influence of human capital technology and economic growth, testing the direction of the influence of the three variables using vector analysis. The period of this research is from 1995 to 2020. The data analyzed is limited to data recorded by the world bank and is general in nature on a national scale. We found that technology has a role in increasing the influence of human capital on economic growth as well as providing a direct influence on economic growth. However, technology is also influenced by the development of human capital and economic growth. Human capital, technology, and economic growth influence and reinforce each other.

Keywords : Labor, Employment, Human Capital, Financial Literacy, Economic Growth

1. INTRODUCTION

The Solow-Swan theory explains that an increase in output or production is determined by technological progress (Harnani & Sudarmawan, 2021). Technological development is related to the level of education that reflects human capital. Education is a key factor in the development of technology. Education is also a determining factor of human performance in the industry (Irawan & Rahayu, 2021; Widarni & Bawono, 2020).

Education provides an increase in the skills needed by the company so that it increases a person's ability to get a job. Education also provides a performance boost that in aggregate in Indonesia can contribute to economic growth (Kholik & Priyanto, 2021). Human capital enables people and enhances human performance which has an impact on company performance. Human capital in Indonesia can boost the performance of companies which nationally can encourage economic growth (Handayani & Sasongko, 2021).

Ghosh & Parab (2021) found evidence that human capital is able to drive economic growth in the long term. However, technology has mixed effects. The results of research by Ghosh & Parab (2021) related to the impact of technology on economic growth are not in line with the results of research by Arjun et al. (2020). Arjun et al. (2020) explain that technology provides an impetus to economic growth and increases the influence of human capital on economic growth.

Human capital can be understood as a technology developer where with human capital, humans can develop technology to improve their performance in the field of work they are involved in. Human capital can also be understood as an individual's ability which is an intangible asset. Human capital is developed through a learning process (WIDARNI & BAWONO, 2021). In human capital investment, of course, there are business aspects that can be measured. So that human capital becomes an important aspect that needs to be researched and understood at an advanced level.

Based on previous research and the Solow-Swan theory, the following empirical questions can be formulated: What is the role of technology in human capital in driving economic growth?

2. LITERATURE REVIEW

In the development of human capital, dimensions are needed in bridging human capital in the form of technology development, human capabilities, and the development of human learning with aspects of the industry or business sector (Herbes et al,2021). Intellectual capital is part of human capital and is a very important aspect of human capital because intellectual capital is a source of creativity (Afriani,2021). Intellectual capital in the company is a key element in the company's performance. However, knowledge capital that can develop the company's performance and competitiveness is the key element in human capital (Meijerink & Bondarouk,2017).

Knowledge capital or intellectual capital that is able to improve company performance makes the company competitive. Human capital is a mixture of abilities and knowledge and experience of employees or humans who work within the company to create competitiveness and improve company performance. Human capital in the company improves the performance of tangible and intangible assets which increases the competitiveness and performance of the company (Olarewaju & Msomi,2021).

The human capital that is inherent in every human being who works for the company requires support in the form of climate or the conditions of the company's work environment. A conducive and comfortable work environment has an impact on optimizing the human capital of each employee in improving employee performance in the company. Human capital needs to be supported by work conduciveness and human capital needs continuous development. Education is one of the keys to human resource development (Zhang et al,2021).

Human capital is a valuable organizational capital because as a source of the organization to be creative and unique and competitive. Human capital in organizations needs to be developed in a learning environment where education and training are key factors in improving organizational performance (Subramony et al,2018). Technology can drive economic growth by improving human performance. Technology also drives the economy through the ease of transactions as well as information technology. Technology makes a variety of human jobs easier and more can be completed faster and better (Shen et al,2021 ;Maneejuk & Yamaka,2020). Based on previous research, the following hypothesis can be formulated:

H1. Technology plays a role in influencing human capital to economic growth in Indonesia.

The period of this research is from 1995 to 2020. The data analyzed is limited to data recorded by the world bank and is general in nature on a national scale.

3. METHODS

To investigate the direction of the influence of human capital technology and economic growth, testing the direction of the influence of the three variables using vector analysis with the following model:

$$T_t = \beta_1 T_{t-1} + \beta_2 T_{t-2} + \beta_3 HC_{t-3} + \beta_4 HC_{t-4} + \beta_5 GDP_{t-5} + \beta_6 GDP_{t-6} + e_t \quad (\text{equation 1})$$

$$HC_t = \beta_1 T_{t-1} + \beta_2 T_{t-2} + \beta_3 HC_{t-3} + \beta_4 HC_{t-4} + \beta_5 GDP_{t-5} + \beta_6 GDP_{t-6} + e_t \quad (\text{equation 2})$$

$$GDP_t = \beta_1 T_{t-1} + \beta_2 T_{t-2} + \beta_3 HC_{t-3} + \beta_4 HC_{t-4} + \beta_5 GDP_{t-5} + \beta_6 GDP_{t-6} + e_t \quad (\text{equation 3})$$

Information :

HC = Human Capital

T = Technology

GDP = Economic growth

β = Constant
t = time period
e = error term

All data are sourced from the world bank which is adapted to research needs with the following variable descriptions:

Table 1. Variable Description

No	Variable	Variable Description	Unit Analysis
1	Human Capital (HC)	Investment in education as a form of investment in human capital nationally and in aggregate (total investment in education) is based on the total unit of calculation based on the current USD value (2021).	USD
2	Technology (T)	All technology investments are calculated based on the total amount of technology investment on a national scale	USD
3	Economic Growth (GDP)	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.	USD

The period of this research is from 1995 to 2020. The data analyzed is limited to data recorded by the world bank and is general in nature on a national scale.

4. RESULT AND DISCUSSION

In order to investigate the direction of the relationship between economic growth, human capital, and technology we carried out an autoregressive vector test which is presented in table 2.

Table 2. Autoregressive Vector Test

	GDP	HC	T
GDP	0.486572	0.017104	0.52202
	-0.35908	-0.0118	-0.68958
	[1.35504]	[1.44891]	[0.75709]
HC	2.03798	0.9442	0.20288
	-11.4671	-0.37698	-0.22017
	[2.35787]	[2.50466]	[0.92149]
T	6.66E-05	4.78E-05	0.058002
	-0.00015	-4.80E-05	-0.27857
	[0.45883]	[0.01002]	[0.20821]
R-squared	0.880047	0.88526	0.898144
Adj. R-squared	0.873004	0.880058	0.89749

Based on the test results by comparing the statistical value with the coefficient value, it can be seen that past GDP has a significant positive effect on current GDP with a coefficient value of

0.486572 and a statistical value of 1.35504. GDP has a significant positive effect on human capital (HC) with a coefficient value of 0.017104 and a statistical value of 1.44891. GDP has a significant positive effect on technology with a coefficient value of 0.52202 and a statistical value of 0.75709.

Human capital (HC) has a significant positive effect on GDP with a coefficient value of 2.03798 and a statistical value of 2.35787. Human Capital in the past has a significant positive effect on human capital today with a coefficient value of 0.9442 and a statistical value of 2.50466. Human capital has a significant positive effect on technology with a coefficient value of 0.20288 and a statistical value of 0.92149.

Technology has a significant effect on GDP with a coefficient value of 0.00666 and a statistical value of 0.45883. Technology has a significant positive effect on human capital with a coefficient value of 0.00478 and a statistical value of 0.01002. Technology has a significant positive effect on the technology itself with a coefficient value of 0.058002 and a statistical value of 0.20821. The adjusted R-squared is 0.8, which means that the fit of the model from the equation being tested is 80%. From the results of the vector test, it can be concluded that the hypothesis is accepted and this study is in line with the research of Shen et al. (2021), Maneejuk & Yamaka (2020), WIDARNI & BAWONO (2021), Handayani & Sasongko. (2021). And, the results of this study are not in line with the research of Arjun et al. (2020). See the direction of movement of each variable is presented in figure 1.

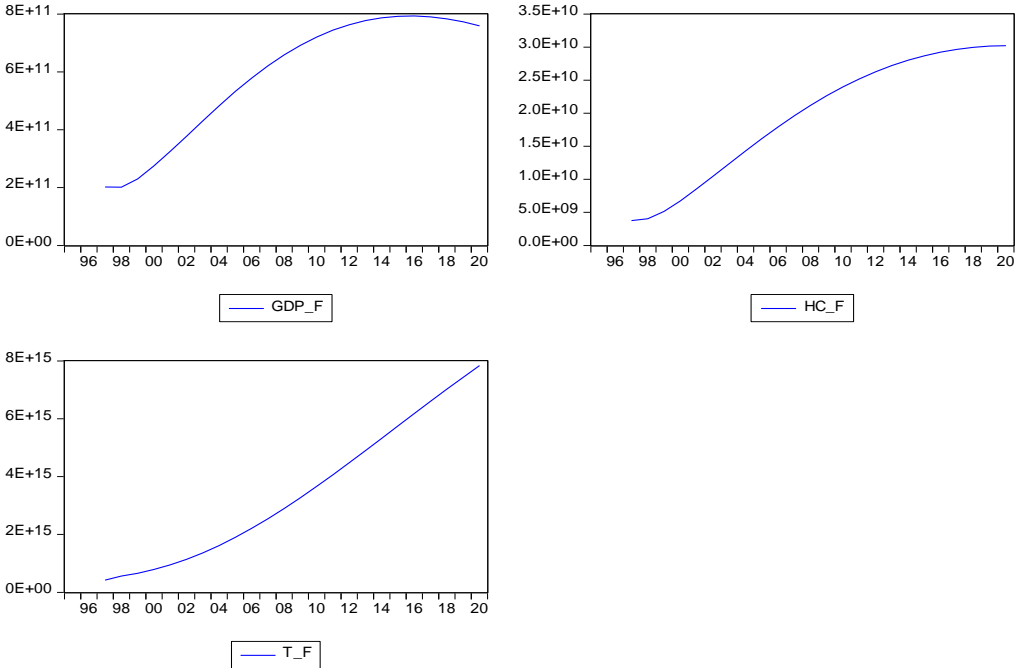


Figure 1. Direction of Movement Forecasting

From the results of forecasting the direction of movement of the three variables, it can be seen that technology, economic growth and human capital have the same direction of movement. This shows that the direction of the relationship between the three variables is unidirectional, which means that human capital, technology and economic growth can influence each other in a positive and significant direction.

5. CONCLUSION

Technology has a role in increasing the influence of human capital on economic growth as well as providing a direct influence on economic growth. However, technology is also influenced by the development of human capital and economic growth. Human capital, technology, and economic growth influence and reinforce each other.

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