Human Capital , Digital Technology Inclusion and Economic Growth in Indonesia

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Abstract

This study investigates the role of human capital development through the mechanisms of education and health, technological inclusion and economic growth in Indonesia. We use secondary data from world banks and the quantitative method of Vector Autoregression analysis. We find that human resource development through education and health mechanisms with indicators of government investment in education and health encourages technological inclusion as indicated by the use of internet access and economic growth.

Keywords: Human Capital, Health Technology Inclusion, Economic Growth
JEL Classification : C10,J24

Introduction

Theoretical education is an effort to increase human capital in the form of increased knowledge which in turn increases thinking power and the ability to understand and learn new skills that are needed. The skills in question are skills needed to earn income or have economic value (Takii & Tanaka, 2009).

Human capital is very inherent in humans (Kankaew, 2021). So that when a disturbance occurs such as a health disorder, it will automatically reduce the human's ability to carry out productive activities. The role of health is a vital factor in efforts to increase human capital in improving organizational performance based on organizational performance.
Digital technology has developed in the form of internet technology which is part of information and communication technology. The development of digital technology inclusion can be seen from the growth of internet users (Lopez-Sintas et al, 2020). The growth of internet users opens up new opportunities and new maps in the business sector. Internet technology presents a new side in the business sector, such as digital business and financial technology, known as fintech.

The role of education and health is expected to be able to increase public participation in the use of digital technology to encourage economic growth. This of course requires joint efforts between the government and the community in realizing a competitive education climate and reliable health to encourage economic growth.

Literature Review

Human capital is inherent in humans where human capital cannot be separated from humans themselves. Human capital includes knowledge, expertise and experience in carrying out productive activities to generate income. Education is one way to increase human capital (Widarni, 2020).

Education is a system in increasing human knowledge and intelligence. Where humans can improve their ability to think, obtain information and learn something so that they are able to develop new skills through the educational process (Adely et al, 2021).

Education plays an important role in ensuring the quality of human resources. Education plays an important role in developing human resources nationally (Soukalová, & Gottlichová, 2015). National education which aims to educate the nation's life becomes the foundation in developing human resources. Quality resources have high human capital where education plays a role in the development of human resources in an aggregate manner. The productivity of human resources nationally can be reflected in economic growth (Nakamura et al, 2018).

Education and economic growth mutually reinforce one another. Where when education is good and able to develop human resources it will have an impact on increasing economic growth. When economic growth increases, there will be an increase in people's income so that human capital investment in the form of education will get better and increase and have an impact on encouraging economic growth in the future (Habibi & Zabardast, 2020).

Technology is a factor that helps human productivity (Brands & Gavin, 2020). Theoretically, production is a function of financial capital and human capital owned by workers or human resources. Increasing the performance of human resources has an impact on production. When performance is improved through technological improvements, productivity will increase. National productivity can be reflected in economic growth.

Research Method

The type of data used in this study is quantitative data, while the data source in this study is secondary data. Secondary data is data that already exists, and has been collected for research purposes. The data population can be defined as the set of all possible observations. The population in this study is all investment in education, investment in health, internet users and gross domestic products that occur in real terms in Indonesia. The sample in this study is represented by all health investment, education investment, internet users and gross domestic products recorded by the world bank.

To obtain representative data (sample), as a basis for determining this sample, the authors do several ways, including:

- Library research, namely by studying the literature related to the title.
- Collect secondary data from the World Bank.

This study using the VAR method to see the response and impulse between variables so that the dependent variable in this study is GDP, Health Investment, Education Investment and Technology Inclusion.

Independent variables are variables that are believed to be predictors that cause fluctuations in the dependent variable. The independent variable of this study uses the VAR method to see the response and impulse between variables so that the independent variables in this study are GDP, Health Investment, Education Investment and Technology Inclusion.

Based on the mathematical model and literature review, it is possible to simulate the likelihood of responses and impulses between variables with unknown future economic data. To see the responses and impulses of the key economic variables that we discuss in this journal, we use the Vector Autoregression (VAR) method to estimate the likelihood that could happen in the future based on forecasting simulations or forecasting. Follows the following equation model:

$Y_t = C + A_1 Y_{t-1} + ... A_p Y_{t-p} + e_t$

Where $Y_t=(Y_{1t},...,Y_{Kt})$ is the set of K time series of variables, c is K x 1 vector of constants, A is K x K coefficient matrix and et is error terms

Vector Autoregression Model (VAR) is an extension of the univariate autoregression model for multivariate time series data. The VAR model is a multi-equation system in which all variables are treated as endogenousous (dependent). There is one equation for each variable as the dependent variable.

We focus on simulating pre-corona response and impulse based on past data sets for the period 2000 to 2019 with the assumption that variables outside the key variables we studied do not change.

Results and Discussion

In understanding the relationship between variables using the Vector Autoregression analysis tool in analyzing the interconnectivity relationship of education and health, technological inclusion and economic growth in Indonesia. The results of the estimation from Vector Autoregression Indonesia are shown in the following table:

Table 1. Estimation Results of Vector Autoregression Indonesia

	EDUCATION	GDP	HEALTH	INTERNET_USER
EDUCATION(-1)	-1.74388	-27.03797	-1.262113	-0.000618
	-0.55094	-20.5381	-0.73594	-0.00119
	[-3.16528]	[-1.31648]	**[-1.71497]**	**[-0.51882]**
EDUCATION(-2)	0.700899	35.83558	0.931657	0.001267
	-0.73524	-27.4085	-0.98212	-0.00159
	[0.95329]	[1.30746]	[0.94861]	**[0.79736]**
GDP(-1)	0.057203	1.727924	0.061987	-4.68E-05

	-0.02438	-0.90893	-0.03257	-5.30E-05
	[2.34609]	**[1.90105]**	**[1.90323]**	**[-0.88762]**
GDP(-2)	-0.050659	-1.331653	-0.029726	-7.92E-05
	-0.02475	-0.92251	-0.03306	-5.30E-05
	[-2.04712]	**[-1.44351]**	**[-0.89924]**	**[-1.48086]**
HEALTH(-1)	1.514991	23.06077	0.676217	0.002735
	-0.53619	-19.9883	-0.71624	-0.00116
	[2.82546]	[1.15371]	**[0.94412]**	**[2.35994]**
HEALTH(-2)	0.173891	-15.69628	-0.36578	0.000179
	-0.69847	-26.0378	-0.93301	-0.00151
	[0.24896]	[-0.60283]	[-0.39204]	**[0.11880]**
INTERNET_USER(-1)	230.4484	4281.436	194.4038	0.779184
	-124.582	-4644.2	-166.415	-0.26923
	[1.84977]	[0.92189]	[1.16819]	[2.89417]
INTERNET_USER(-2)	29.7435	-4493.341	-194.3052	0.669918
	-205.06	-7644.27	-273.916	-0.44314
	[0.14505]	[-0.58780]	[-0.70936]	[1.51175]
C	2.45E+09	7.81E+10	-4.47E+08	8345455
	-1.90E+09	-6.90E+10	-2.50E+09	-4011951
	[1.32055]	[1.12811]	[-0.18036]	[2.08015]
R-squared	0.995054	0.988728	0.985512	0.997171
Adj. R-squared	0.990657	0.978708	0.972634	0.994656
Sum sq. resids	1.39E+19	1.93E+22	2.48E+19	6.50E+13
S.E. equation	1.24E+09	4.64E+10	1.66E+09	2686942
F-statistic	226.3099	98.67627	76.52734	396.5219
Log likelihood	-396.2421	-461.3735	-401.4535	-285.773
Akaike AIC	45.0269	52.26372	45.60594	32.75256
Schwarz SC	45.47209	52.70891	46.05113	33.19774
Mean dependent	2.34E+10	6.75E+11	1.94E+10	39018296
S.D. dependent	1.29E+10	3.18E+11	1.00E+10	36755952
Determinant resid covariance (dof adj.)	2.47E+69			
Determinant resid covariance	1.54E+68			

Log likelihood	-1515.26
Akaike information criterion	172.3622
Schwarz criterion	174.1429
Number of coefficients	36

Education in the first period had an impact on education itself -3.16528, health -1.71497, Internet users -0.51882. Based on the results of these estimates, it is indicated that when the human capital investment process occurs, it has a significant impact on education itself -3.16528, health -1.71497, Internet users -0.51882.

Based on the results of the second-period estimation, it is indicated that when the human capital investment process occurs, it has a significant impact on education itself 0.95329, and Internet users 0.79736.

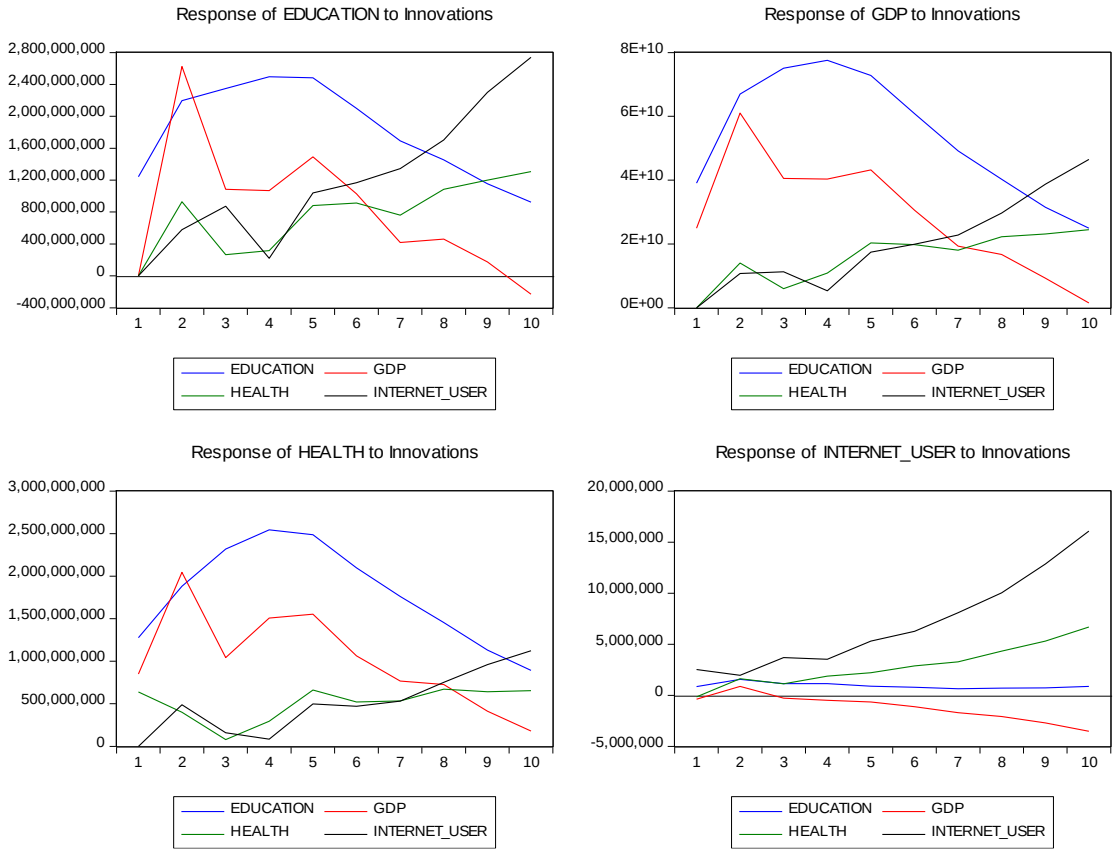
Human capital investment has an impact on reducing educational capacity which is possible due to the renovation of educational infrastructure so that it cannot be used in the first period but when the investment process is complete there is an impact in the form of increased education and internet users. The estimation results show that human capital investment in education does not have a significant impact on health because education and health are two different components. When investment in education occurs, the health investment budget will decrease due to sharing with education investment so that in the first period there is a significant negative relationship and period. secondly, there is no significant relationship between education and health.

GDP or economic growth has a significant impact on all variables, which means that all human capital investment in both the health, education and internet infrastructure sectors comes from GDP. The health variable has a significant positive relationship to all variables except GDP in the first period. However, it only has a positive significant impact on the technology variable which indicates that health has an impact on all sectors and health investment encourages people to behave productively in including internet technology.

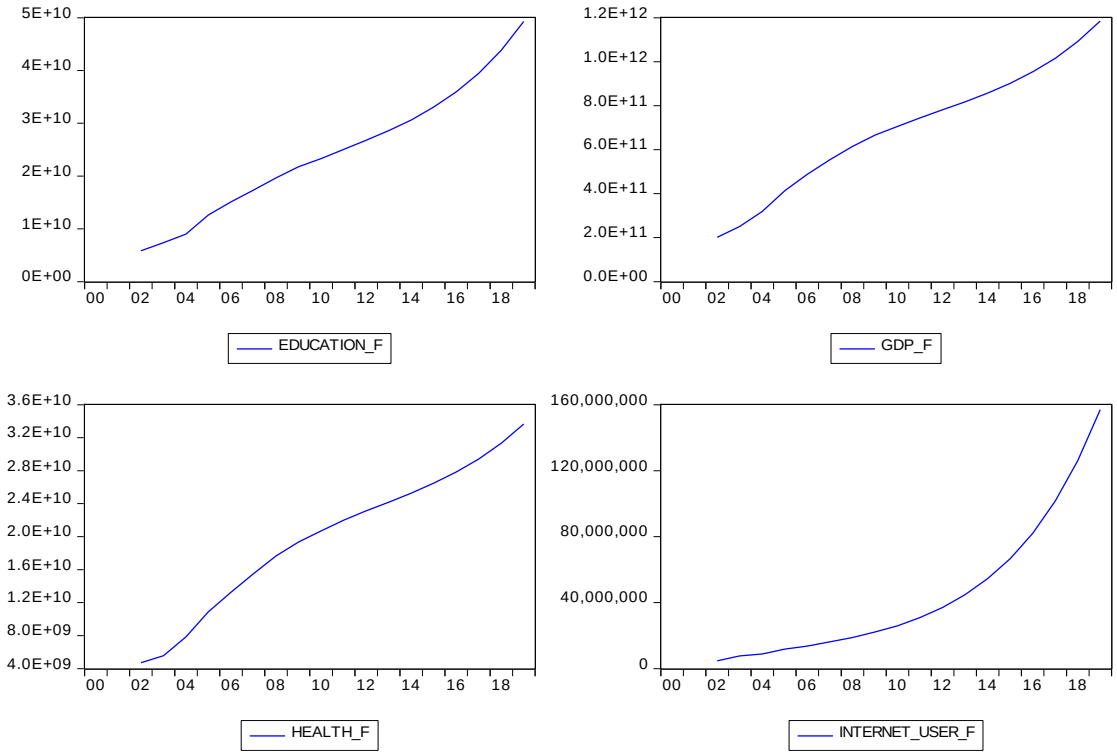
Internet User variables are not significantly related to all variables in the first period. In the second period, there is no significant positive relationship between education and Internet users themselves. However, negativity is not significant for GDP and health. This shows that the use of the internet in Indonesia is not maximal enough to encourage or influence all of these variables in Indonesia.

Impulse Response Function (IRF) describes the response of an endogenous variable to shock that occurs in other variables that exist in a dynamic VAR system. IRF can be used to see the effect of fluctuation or shock from one variable on the value of another variable, either at present or in the future. By understanding the impulse response, past data behaviour can be understood to predict or predict and simulate what will happen in the future. So that a policy can be decided in achieving a goal. Suppose the amount of human capital investment needed to improve the economy through the education mechanism. This becomes important in preparing budget allocations in human resource management. The results of the Impulse Response Function (IRF) are shown in the following graph:

Graph 1. Results of Indonesia's Impulse Response Function (IRF)



From the results of the impulse response, it can be seen that there is a positive relationship or unidirectional graph between education and economic growth with several shocks and in the opposite direction to health and Internet users. This indicates a close relationship between the economy supported by education and health which is supported by the inclusion of Internet technology. To understand the data behavior of the 4 variables, forecasting is carried out with the assumption that there will be no major shocks after 2019 as follows:



When forecasting data movement there is a unidirectional relationship direction for all variables. This indicates a mutually reinforcing relationship between education, technology, economic growth and health. So that human capital investment in the fields of health, technology and education will have an impact on encouraging economic growth in Indonesia. With a different impact process on each variable described in the Impulse Response Function where the education sector has a dominant impact in driving economic growth.

Conclusion

Human capital investment in education has a dominant impact on economic growth and has the same driving direction as the health sector and Internet technology inclusion. This shows that human capital investment is very important in increasing economic growth.

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