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The Role of the Digital Economy in The Economy, Education, and Health in Indonesia

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Abstract

This study examines the digital economy shown by internet users with economic growth, education, health, and inflation.This research examines data from 2000 until 2020 to be able to produce "autoregressive vectors" that may be used to evaluate the causal link between variables. Based on secondary data from the World Bank, the following multivariate regression model was used to investigate the causal link between Internet Users, Gross Domestic Product, Education, Health and Inflation in Indonesia. The results of this study are quite surprising where technological literacy in Indonesia actually suppresses GDP, this shows that the use of the internet for Indonesian people in production is not yet optimal. Or most Indonesians use the internet as entertainment and consume digital products from abroad so internet technology literacy suppresses GDP. However, internet literacy supports education in Indonesia where education in Indonesia uses internet technology massively. Education itself encourages internet literacy in Indonesia significantly. However, the literacy of internet users actually suppresses the health sector where the health sector in Indonesia during the research period was dominated by offline and the health sector did not provide a significant boost to internet literacy in Indonesia. The digital economy in Indonesia has been proven to suppress inflation, although not significantly. This illustrates that the digital economy has the potential to suppress inflation and in the current case of Indonesia, the digital economy is not yet optimal currently the majority of internet users in Indonesia are users or consumers of digital products from countries outside Indonesia so they have not been able to encourage domestic economic growth.

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Background

The digital economy is growing massively. In particular, the contribution of digitalization to the economy continues to increase. The transformation of the digital economy is increasing over time and so is the number of Internet users. GDP as an economic indicator is increasingly influenced by the digital economy and the increase in internet users (Priyanto et al.,2022 ; Watanabe et al.,2018).

Innovation is key in an increasingly massive digital economy so that human capital is important in economic growth. Education and health are two key factors in the development of human capital. Human capital is a key asset for a company's success in the digital era. The digital business structure is growing big enough to break its own record. In the first year of the pandemic, the digital economy grew with an increasing contribution to Gross Domestic Product (GDP). The digital economy drives public consumption and economic growth. The contribution of people working in digital or technology environments is growing in the economy. Companies that have been more digitized have become more resilient during a pandemic. A more digitized economy is one that is stronger and more competitive. SMEs that adapt digital technology in their business can be more efficient with fewer resources and thereby gain more capacity for growth and productivity (Sulisnaningrum et al.,2022 ; Ma & Zhu, 2022).

The digital economy has grown. But major difficulties remain in measuring full digitization, especially since some are outside traditional market exchanges and thus are not recorded in conventional statistics. The digital economy is an economy that integrates ICT infrastructure, exchange of digital goods and services (e-commerce) and digital content. Using information from the supply side of the economy. The digital economy is more dynamic than conventional. The digital economy has a lower inflation rate than the traditional economy (Widarni & Bawono, 2022 ; Ni, 2022).

Many digital transactions do not have an explicit market price. Digital products and services are subject to the dynamics of rapidly changing quality and obsolescence, which makes it difficult to calculate prices correctly. Digital technology treats free goods in the same way as free public services, that is, valuing them by the cost of production. The costs of producing free digital media and other similar services are financed from the revenue generated by advertising and marketing. In free digital media, consumers enjoy goods free digital in exchange for viewing ads and marketing. Digital technology simulates a hypothetical market and tries to deduce from it the value of a particular digital good. This path, which is common in environmental economics for valuing intangibles such as landscape value, is the path followed (Chapuzet & Bawono, 2021 ; Irfan et al., 2022).

An economy with a high level of digitalization is followed by an increase in economic growth. It is also relevant to identify relative strengths and weaknesses. High digitization encourages an increase in Internet users and economic transactions on the Internet. The effective growth of the digital economy is higher than the conventional economy, the digital economy can also operate with a lower inflation rate than the traditional economy (Bawono, 2021 ; Zhu et al., 2022). This study examines the digital economy shown by internet users with economic growth, education, health, and inflation.

Research Method

This research examines data from 2000 until 2020 to be able to produce "autoregressive vectors" that may be used to evaluate the causal link between variables. Based on secondary data from the World Bank, the following multivariate regression model was used to investigate the causal link between Internet Users, Gross Domestic Product, Education, Health and Inflation in Indonesia. Here's the model :

$IR_t = \beta_0 + \beta_1 GDP_t + \beta_2 ED_t + \beta_3 HL_t\ e_t$ eql 1
$GDP_t = \beta_0 + \beta_1 IR_t + \beta_2 ED_t + \beta_2 HL_t\ e_t$ eql 2
$ED_t = \beta_0 + \beta_1 IR_t + \beta_2 GDP_t + \beta_2 HL_t\ e_t$ eql 3
$HL_t = \beta_0 + \beta_1 IR_t + \beta_2 GDP_t + \beta_2 ED_t\ e_t$ eql 4

Description :

IR : Internet Users
GDP : Gross Domestic Product
ED : Education
HL : Health
IN : Inflation
t : time series
β : the magnitude of the effect of causality
eql: equation

This study uses vector calculations where each regression relationship will be brought together so that each variable will alternately become the dependent variable and the independent variable. The zero theory of Dickey-Fuller, taken from the PP test, and p=1 is the formula in $\Delta yt = (\rho - 1)yt\text{-}1 + ut$, in which Δ – for the first time different operators. This research used the following equation for the "unit root test":

$$\Delta Y_1 = \alpha_0 + \beta_0 T + \beta_1 Y_{t-1} + \sum_{i-1}^{q} \alpha_1 \Delta Y_{t-1} + e_t$$

Description:

Y as the variable is being examined for unit root
T as the variable which indicates the “linear trend,” the “lag difference” means is $\Delta Yt-1$,
$\alpha 0$ are shown as “constant term,” with the
"t" as a "time trend" indicator.
The null and alternative hypotheses for the "unit root test" are as follows:
H_0: $\alpha=0$
H_1: $\alpha\neq0$

Result and Discussion

The ADF test evaluates the probability of autocorrelation in the error component if the series being evaluated is non-stationary. The following are the results of the unit root test:

Table 1: ADF's Unit Root Test on IR, GDP, ED, HL and Inflation data in Indonesia

Variable	Unit Root	Include in the examination Equation	Statistics for the ADF Test	5% Critical Value	Description
Internet Users (IR)	Level	Intercept	6.626153	1.0000	
	First Diff	Intercept	-0.254496	0.9143	
	Second Diff	Intercept	-7.999192	0.0000	Stationer
Gross Domestic Product (GDP)	Level	Intercept	-0.527808	0.8660	
	First Diff	Intercept	-1.929268	0.3129	
	Second Diff	Intercept	-3.319458	0.0293	Stationer
Education (ED)	Level	Intercept	-1.943341	0.3073	
	First Diff	Intercept	-5.433040	0.0004	Stationer
Health (HL)	Level	Intercept	-0.288385	0.9106	
	First Diff	Intercept	-2.933484	0.0600	
	Second Diff	Intercept	-4.923879	0.0011	Stationer
Inflation (IN)	Level	Intercept	-1.603876	0.4613	
	First Diff	Intercept	-5.809191	0.0002	Stationer

The ED and IN data at the first difference, the data are stationary, and the HL, GDP and IR data at the second difference level is stationary. The ADF test is worth -5.433040 with a critical value of 0.0004. Smaller than the p-value, in this case, the ED data shows stationary at the first difference compared to the original data. From here we can take the next step in determining vector analysis.

The lag duration sensitivity is required for both the VAR and the causality tests. It's vital to pick an appropriate optimal lag time before starting a VAR or causality test inquiry. The following are the findings of the lag test:

Table 2 : Optimum lag test at Lag 0 to 2 IR, GDP, ED and HL data

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-231.7163	NA	45643.14	24.91751	25.16604	24.95957
1	-138.2526	127.8977 *	37.83191	17.71080	19.20202	17.96317
2	-100.4918	31.79855	20.03500	16.36756	19.10146	16.83025

			*	*	*	*

Table 2 shows the findings of the Optimum Lag test. At Lag 0 to 2, the results show that the variable lengths of lag IR, GDP, ED and HL data are at FPE, AIC, SC, and HQ at Lag 2. Because the findings of the five components are identical, then lag 2 will be chosen.

Table 4 : VAR Model Analysis

	IR	GDP	ED	HL	IN
IR	0.325786	-0.076357	0.017385	-0.043982	-1.966544
	(0.32864)	(0.18314)	(1.61403)	(0.06210)	(1.13230)
	[0.99130]	[-0.41692]	[0.01077]	[-0.70821]	[-1.73678]
GDP	-1.042112	0.298882	-7.882383	0.055119	0.492856
	(0.70166)	(0.39102)	(3.44597)	(0.13259)	(2.41746)
	[-1.48521]	[0.76437]	[-2.28742]	[0.41571]	[0.20387]
ED	0.148321	0.191792	-0.419934	-0.039017	0.179247
	(0.05104)	(0.02844)	(0.25066)	(0.00964)	(0.17585)
	[2.90605]	[6.74313]	[-1.67530]	[-4.04540]	[1.01933]
HL	4.904472	0.473442	26.25202	0.479641	8.316874
	(2.41367)	(1.34507)	(11.8540)	(0.45611)	(8.31594)
	[2.03196]	[0.35198]	[2.21462]	[1.05159]	[1.00011]
IN	0.230301	0.042195	-0.197338	0.007916	0.654523
	(0.12050)	(0.06715)	(0.59179)	(0.02277)	(0.41516)
	[1.91124]	[0.62837]	[-0.33346]	[0.34766]	[1.57656]
C	4.792275	2.197875	-21.32613	0.551341	24.39302
	(3.76846)	(2.10006)	(18.5076)	(0.71212)	(12.9837)
	[1.27168]	[1.04658]	[-1.15229]	[0.77422]	[1.87875]
R-squared	0.997831	0.948013	0.895322	0.916570	0.753705
Adj. R-squared	0.995120	0.883029	0.764474	0.812283	0.445837
Sum sq. resids	9.753451	3.028969	235.2501	0.348289	115.7779
S.E. equation	1.104165	0.615322	5.422755	0.208653	3.804240
F-statistic	368.0761	14.58840	6.842481	8.788886	2.448143
Log likelihood	-20.62506	-9.515774	-50.86383	11.03221	-44.12857
Akaike AIC	3.328954	2.159555	6.511982	-0.003391	5.803007
Schwarz SC	3.875734	2.706336	7.058763	0.543390	6.349787
Mean dependent	17.21472	4.977976	72.98457	2.788701	7.294875
S.D. dependent	15.80659	1.799132	11.17380	0.481585	5.110333

The relationship between IR and ED itself is significantly positive, with something like a coefficient of 0.017385 and a t-statistic of 0.01077. The relationship between GDP and HL is significantly positive with a coefficient of 0.055119 and a t-statistic of 0.41571, meaning that the higher the GDP, the higher the HL. Likewise, the relationship between GDP and ED is significantly negative, with a coefficient of -7.882383 and a t-statistic of -2.28742, meaning that the lower the GDP, the higher the ED. The relationship between HL, and IR, GDP, ED, HL and in is positive. The relationship between IN and ED is significantly negative with coefficient of -0.197338 and a t-statistic of -0.33346. The is significantly negative, as evidenced by the

coefficient -0.620130 and the t-statistic -1.65629. This shows that an increase in Internet Users will increase Education, a decrease in GDP in this study will also increase Education.

Table 5 : Granger Causality test

Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause IR	19	0.58759	0.5688
IR does not Granger Cause GDP		4.99919	0.0230
ED does not Granger Cause IR	19	4.28686	0.0353
IR does not Granger Cause ED		6.26067	0.0114
HL does not Granger Cause IR	19	0.59923	0.5627
IR does not Granger Cause HL		4.23393	0.0365
IN does not Granger Cause IR	19	0.12134	0.8867
IR does not Granger Cause IN		3.74720	0.0497
ED does not Granger Cause GDP	19	93.2910	8.E-09
GDP does not Granger Cause ED		0.66712	0.5288
HL does not Granger Cause GDP	19	0.71167	0.5077
GDP does not Granger Cause HL		0.26187	0.7733
IN does not Granger Cause GDP	19	1.15717	0.3427
GDP does not Granger Cause IN		0.26955	0.7676
HL does not Granger Cause ED	19	2.00725	0.1712
ED does not Granger Cause HL		32.6585	5.E-06
IN does not Granger Cause ED	19	0.19272	0.8269
ED does not Granger Cause IN		3.00069	0.0823
IN does not Granger Cause HL	19	0.42322	0.6630
HL does not Granger Cause IN		0.52747	0.6014

Table 4 shows the findings of the Granger causality test study. The findings reveal that there is no single causal link between variables, as shown by the fact that none of them has a probability of less than 5%.

Conclusion

The results of this study are quite surprising where technological literacy in Indonesia actually suppresses GDP, this shows that the use of the internet for Indonesian people in production is not yet optimal. Or most Indonesians use the internet as entertainment and consume digital products from abroad so internet technology literacy suppresses GDP. However, internet literacy supports education in Indonesia where education in Indonesia uses internet technology massively. Education itself encourages internet literacy in Indonesia significantly. However, the literacy of internet users actually suppresses the health sector where the health sector in Indonesia during the research period was dominated by offline and the health sector did not provide a significant boost to internet literacy in Indonesia. The digital economy in Indonesia has been proven to suppress inflation, although not significantly. This illustrates that the digital economy has the potential to suppress inflation and in the current case of Indonesia, the digital economy is not yet optimal currently the majority of internet users in Indonesia are users or consumers of digital products

from countries outside Indonesia so they have not been able to encourage domestic economic growth.

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