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The Impact of Digital Development on Economic Growth in Selected ASEAN Countries

[1]Ariska Damayanti*, [2]Fathurrahman Priyanta*, [3]Toifsa Rosita Dewi*

[1]Department of Development Economics, Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia
[1]Department of Development Economics, Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia
[1]Department of Development Economics, Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia

Abstract:
This study examines the influence of digital development on economic growth in five ASEAN countries: Indonesia, Malaysia, Cambodia, the Philippines, and Vietnam. As technology adoption accelerates, digital indicators such as internet usage, mobile phone subscriptions, and broadband access are becoming key contributors to national economic performance. Using panel data from 2009 to 2019 sourced from the World Bank, this research applies a multiple linear regression analysis to evaluate the impact of digital variables on Gross Domestic Product (GDP). The best-fit model, determined through Chow, Hausman, and Langrangian Multiplier tests, is the Random Effect Model (REM). The findings reveal that both internet usage and mobile subscriptions have a significant positive impact on GDP, while broadband subscriptions do not show a significant individual effect. However, when considered collectively, all digital development indicators significantly influence GDP. These results underscore the importance of digital infrastructure and connectivity in driving inclusive economic growth within ASEAN.

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Keywords:
ASEAN, Digital Development, Economic Growth, GDP

Corresponding Author:
Ariska Damayanti, Fathurrahman Priyanta

Email:
ariskadamayanti@gmail.com

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1. Introduction

Technology continues to develop over time, initially the function of this technology was still very limited, but currently development continues to be carried out so that technology is increasingly advanced and developing. The rapid development of technology has encouraged the era of digitalization. Digital development continues to be carried out in various fields with the aim of making people's lives easier. The development of digital technology can have a big influence on all aspects of life, such as social aspects, cultural aspects and economic aspects. Technology is mainly used in accessing information and communication.

As with the internet today, it can speed up the exchange of information and make communication easier, apart from that, with this facility it can increase the efficiency of costs that must be spent on information and communication needs.

According to WorldBank, there are three main indicators that can be used to measure digital development in a country, including: 1. Individuals using the Internet; 2. Mobile Cellular subscriptions; and 3. Fixed Broadband Subscriptions. So the higher the number of these indicators in a country, the more advanced digital development in that country. The convenience provided by digital development certainly provides encouragement to increase a country's economic growth.

Currently, almost all age groups, from children to adults, already own and use cellphones for daily communication. Since the pandemic struck, the need for technology has increased. Various work sectors require technology to meet their needs. Based on a report from Stock Apps, it is clear that cellphone users in the world have reached 5.3 billion, which shows that 67% or more than half of the world's people use cellphones.

The use of this cellphone is used for various positive things. Various sectors that use this technology are service providers, sales of goods, meetings and telecommunications. Since the unemployment rate has increased due to the pandemic, many people have opened businesses, both offline and online. This is still a trend and is popular with many people today. The development of this trend is called e-commerce, which is a form of the digital economy. The existence of e-commerce makes transactions easier for sellers and buyers. The sales reach is wide, both between cities, between provinces and even abroad. Sales do not only come from online buying and selling application platforms, but currently social media provides services for selling goods and can be used easily by both sellers and buyers. These conveniences are what encourage people to prefer going online, causing the number of gadget users to grow rapidly.

Based on theories put forward by several experts, technology has an important role in economic growth. Good economic growth can make society prosperous. The rapid growth of the digital economy is not only felt in Indonesia, but also in all countries, especially ASEAN countries. Rapid technological developments have caused several changes in various sectors in each ASEAN country. Changes in the country in the development of communication and transportation technology in the social aspect, namely the increase in population in a short time, foreign cooperation becoming easier, the need for mass transportation increasing to avoid traffic jams. Then changes in the economic aspect are that the value of local goods is increasing along with the demand for foreign currency, increasing state income from taxes and residential rentals due to the emergence of shopping centers, tourism and residences, goods from abroad are becoming easier to reach.

The rapid development of the digital economy has caused economic growth to increase well. Economic growth, according to Robert Solow, one of the economists, is that economic growth will occur if there is output growth. Output growth occurs if two input factors are combined, namely capital and labor, while technology is considered constant. The capital inputs are raw materials, machines, equipment, computers, buildings and money. Apart from that, according to Joseph Schumpter, economic growth occurs when there is innovation from entrepreneurs or entrepreneurs. Innovation in this case is the application of new knowledge and technology in the business world.

2. Literature Review

2.1. Theoretical Foundations

Economic growth, according to Robert Solow, an influential economist, occurs when there is growth in output. This growth in output is a result of the combination of two key input factors: capital and labor. In this model, technology is considered constant. Capital inputs include raw materials, machines, equipment, computers, buildings, and money, all of which contribute to the production process.

On the other hand, Joseph Schumpeter presents a different perspective on economic growth, emphasizing the role of innovation. According to Schumpeter, economic growth is driven by innovation, which is introduced by entrepreneurs. In this context, innovation refers to the application of new knowledge and technology within the business world, leading to the development of new products, services, and processes that fuel economic expansion.

2.2. Previous Research

The digital economy has emerged as a transformative force in national economic systems, enabling productivity enhancements, entrepreneurial activity, and international trade. Early empirical studies such as Edi (2018) demonstrate that digital indicators, including internet penetration and ICT infrastructure, partially exert a positive and significant influence on GDP. However, not all contributing factors show similar impacts; for instance, economic openness was found not to significantly affect GDP in the same model. Expanding upon this, Efa (2019) emphasizes that the growth of the digital economy has consistently increased its contribution to GDP over the years, largely through the rise of young digital entrepreneurs and start-up ecosystems.

Sianturi (2017) conceptualized the digital economy as being founded on three fundamental pillars: infrastructure (hardware, software, telecommunication), e-business, and e-commerce. His findings affirm that increased participation in digital-based business activities can significantly enhance national economic performance. This is supported by Imantoro et al. (2019), who highlight how the e-economy and fintech platforms allow individuals to generate income rapidly through online means, even in regions outside metropolitan centers. Similarly, Aryani et al. (2020) conclude that the adoption of ICT, including internet usage and broadband connectivity, positively impacts Indonesia's trade value within ASEAN, especially when coupled with cross-border B2B e-commerce transactions.

These findings are reinforced by recent empirical evidence. Le (2025) confirms that digital transformation indicators, particularly broadband subscriptions and the value-added share of high-tech manufacturing, significantly enhance trade openness and economic integration across ASEAN-6 countries, including Indonesia. In parallel, Ngah et al. (2024) emphasize that digital economy proxies such as broadband density and internet usage contribute positively to employment generation, suggesting structural labor market benefits from digital adoption.

He and Wang (2019) provide panel evidence from ASEAN that internet penetration fosters cross-border e-commerce trade, indicating digitalization's key role in reducing trade barriers. Chen (2019), in an ERIA study, predicts e-commerce revenue in ASEAN will quadruple GDP growth between 2018 and 2023, with Indonesia emerging as the largest and fastest-growing market. Nguyen and Le (2023) also substantiate that ICT adoption consistently correlates with economic growth across ASEAN-5 nations, further legitimizing digital policy initiatives.

Complementing these regional findings, Meidyasari (2024) and Hartanto et al. (2021) assert that the Indonesian digital economy, driven by e-commerce, digital payment systems, and online platforms, has bolstered national productivity, market efficiency, and innovation. Studies from ERIA (2022, 2023) and ASEAN Secretariat (2021) echo this sentiment, identifying digital connectivity as a catalyst for inclusive growth, particularly when supported by policies aimed at improving SME access to digital infrastructure.

The Asia Competitiveness Institute (2023) and INDEF (2019) have highlighted how digital transformation not only strengthens trade but also empowers local industries, as evidenced by a 25 percent contribution of local products to digital marketplace revenues. Meanwhile, ERIA (2024) emphasizes the persistence of digital divides within Indonesia's MSME sector due to insufficient ICT skills and limited local government support.

Lastly, empirical studies by Wardani et al. (2020), Kearney (2022), and ADB Institute (2021) underline the role of fixed broadband penetration, mobile phone subscriptions, and B2B digital transactions in enhancing Indonesia's service exports and regional trade competitiveness.

Together, these studies provide robust evidence that the digital economy not only accelerates GDP growth but also facilitates inclusive trade, entrepreneurial dynamism, and labor market flexibility. These elements are especially critical in a post-pandemic ASEAN context increasingly reliant on digital connectivity.

3. Data and Methodology

The population used in this research comes from secondary data obtained from the World Bank. The data used in this research is panel data, which was obtained using time series data, namely 11 years and cross section data from 5 countries in ASEAN, namely Indonesia, Malaysia, Cambodia, the Philippines and Vietnam.

In this research, the dependent variable is Gross Domestic Product (GDP), while the independent variables include the number of people using the internet, mobile phone subscribers, and broadband internet subscribers. The data analysis method used is quantitative, with Stata employed for data processing. Multiple linear regression analysis is utilized to examine the relationship between the independent variables and the dependent variable. Panel data is used in this study, and three estimation techniques are considered: pooled least squares, fixed effect models, and random effect models.

To determine the best model, several tests are conducted, including the Chow test, Hausman test, and Langrangian multiplier test. A classical assumption test is also performed, which involves normality, multicollinearity, heteroscedasticity, and autocorrelation tests, along with partial t-tests, simultaneous F-tests, and a coefficient of determination test.

Before proceeding with hypothesis testing, classical assumption tests are conducted to ensure the validity of the model's parameters. The normality test checks whether the data follows a normal distribution, while the multicollinearity test examines if there is a correlation among the independent variables in the regression model. The presence of multicollinearity is assessed by analyzing the Variance Inflation Factor (VIF). Multiple linear regression analysis serves to estimate the relationship between the dependent and independent variables, with the primary goal being to predict the value of one variable based on others. Hypothesis testing is performed to assess the significance of the model, utilizing the partial t-test to determine the impact of individual independent variables, the simultaneous F-test to evaluate the combined effect of the independent variables, and the coefficient of determination test to measure how much of the variance in the dependent variable can be explained by the independent variables.

4. Result and Discussion

There are 3 panel data regression estimation tests, namely Common Effect (OLS), Fixed Effect Model (FEM) and Random Effect Model (REM). To determine the best model in this research, several tests must be carried out, namely the Chow Test, Hausman Test, Langrangian Multiplier (LM) Test.

The first test is the Chow Test, where this test is used to determine the selected model between Common Effect or Fixed Effect Model.

H0: The best model selected is the Common Effect
H1: The best model selected is Fixed Effect

Table 1. Chow Test Results
Source : Analysis, 2023

```
. reg GDP PUI MPS BIS i.Kode
```

Source	SS	df	MS	Number of obs	=	52
				F(7, 44)	=	33254.69
Model	606.374521	7	86.6249315	Prob > F	=	0.0000
Residual	.11461533	44	.002604894	R-squared	=	0.9998
				Adj R-squared	=	0.9998
Total	606.489136	51	11.8919438	Root MSE	=	.05104

GDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
PUI	-.0109479	.000923	-11.86	0.000	-.0128082	-.0090877
MPS	-.002277	.0003899	-5.84	0.000	-.0030627	-.0014913
BIS	-.0093674	.0049897	-1.88	0.067	-.0194236	.0006887
Kode						
2	9.554081	.0372643	256.39	0.000	9.47898	9.629183
3	5.280052	.02373	222.51	0.000	5.232227	5.327876
4	6.499659	.0243953	266.43	0.000	6.450493	6.548824
5	1.489727	.0312666	47.65	0.000	1.426713	1.552741
_cons	-36.14753	.0437395	-826.43	0.000	-36.23568	-36.05938

```
. testparm i.Kode

 ( 1)  2.Kode = 0
 ( 2)  3.Kode = 0
 ( 3)  4.Kode = 0
 ( 4)  5.Kode = 0

       F(  4,     44) =38640.19
            Prob > F =    0.0000
```

If the P value (Prob>F) < 0.05, then H1 is accepted, meaning the best model selected is the Fixed Effect Model (FEM). In the chow test results, the Prob>F value shows 0.000 < 0.05, so the model chosen in this test is the Fixed Effect Model (FEM).

Hausman Test

The second test is the Hausman Test where this test is used to determine the selected model between Random Effect or Fixed Effect Model.

H0: The best model chosen is Random Effect
H1: The best model selected is Fixed Effect

Table 2. Hausman Test Results
Source : Analysis, 2023

	Coefficients (b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
PUI	-.0109363	-.0109479	.0000117	.0002432
MPS	-.0022797	-.002277	-2.73e-06	.0001027
BIS	-.0093805	-.0093674	-.0000131	.0013148

```
                b = consistent under Ho and Ha; obtained from xtreg
    B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

            chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                    =          0.00
          Prob>chi2 =      1.0000
```

If the P value (Prob>Chi2) > 0.05, then H0 is accepted, meaning the best model selected is the Random Effect Model (REM). Based on the results of the Hausman test, the prob>Chi2 value is 1,000 > 0.05, the best model selected is the Random Effect Model (REM).

Langrangian Multiplier Test (LM Test)

The third test is the Langrangian Multiplier Test (LM Test) where this test is used to determine the selected model between Random Effect or Common Effect Model.

H0: The best model chosen is Random Effect

H1: The best model selected is the Common Effect

Table 3. Langrangian Multiplier Test Results
Source : Analysis, 2023

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        GDP[Kode,t] = Xb + u[Kode] + e[Kode,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     GDP |   11.89194        3.44847
                       e |   .0026049       .0510382
                       u |   8.104008       2.846754

        Test:   Var(u) = 0
                                 chibar2(01) =   125.47
                              Prob > chibar2 =   0.0000
```

If the P value (Prob>Chibar2) < 0.05, then H0 is accepted, meaning the best model selected is the Random Effect Model (REM).

Based on the LM test results, the Prob>Chibar2 value is 0.000 < 0.05, so the best model selected is the Random Effect Model (REM). Based on the three tests that have been carried out, the results of 2 of the 3 tests show the Random Effect Model (REM). So the best model chosen in this research is the Random Effect Model (REM).

Normality test

Table 4. Normality Test Results
Source : Analysis, 2023

```
. sktest PUI MPS BIS

                    Skewness/Kurtosis tests for Normality
                                                      ------ joint ------
    Variable |        Obs  Pr(Skewness)  Pr(Kurtosis) adj chi2(2)    Prob>chi2
-------------+-------------------------------------------------------------
         PUI |         53       0.3444       0.1413        3.23        0.1992
         MPS |         55       0.0000       0.0002       27.26        0.0000
         BIS |         54       0.0511       0.5476        4.28        0.1174
```

Normality testing uses the Skewness/Kurtosis test, by looking at the Prob>chi2 value, that is, if the value is more than 0.05 then the residual is normally distributed. Based on the results of the Skewness/Kurtosis test for Normality above, we can conclude that only the PUI (People using internet) and BIS (Broadband Internet Subscriber) variables have normally distributed residuals. Meanwhile, for the MPS (Mobile Phone Subscriber) variable, the residual is distributed non-normally.

Multicolinearity Test

Table 5. Multicolinearity Test Results
Source : Analysis, 2023

```
. vif, uncentered
```

Variable	VIF	1/VIF
PUI	17.57	0.056916
BIS	9.97	0.100349
MPS	5.47	0.182878
Mean VIF	11.00	

The data will be free from multicollinearity if the VIF value <10 and the 1/VIF value> 0.01. Based on the results of the multicollinearity test, it shows that the Broadband Internet Subscriber (BIS) and Mobile Phone Subscriber (MPS) variables are free from multicollinearity because each VIF value of these variables is < 10. Meanwhile, the VIF value of the People Use Internet (PUI) variable is > 10, so This variable is not yet free from multicollinearity

Partial T Test, Simultaneous F And Determination Coefficient

Table 5. Multicolinearity Test Results

Source : Analysis, 2023

```
. reg GDP PUI MPS BIS i.Kode
```

Source	SS	df	MS		
				Number of obs	= 52
				F(7, 44)	= 33254.69
Model	606.374521	7	86.6249315	Prob > F	= 0.0000
Residual	.11461533	44	.002604894	R-squared	= 0.9998
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Kode						
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5	1.489727	.0312666	47.65	0.000	1.426713	1.552741
_cons	-36.14753	.0437395	-826.43	0.000	-36.23568	-36.05938

Partial t test

If the P>ltl value is <0.05 then the data can be said to be significant. The P>ltl value of the PUI variable is 0.00 < 0.05, so individually the PUI variable has a significant effect on GDP. The P>ltl value of the MPS variable is 0.00 < 0.05, so individually the MPS variable has a significant effect on GDP. The P>ltl value of the BIS variable is 0.067 > 0.05, so individually the BIS variable does not have a significant effect on GDP.

Simultaneous F Test

If the F test value is <0.05 or the calculated F value is > F table then simultaneously the independent variable has a significant effect on the dependent variable. Df1 = 3, DF2 = 48, F table value is 2.798. The calculated F value is 33254.69 > F table, so that simultaneously the independent variable has a significant influence on the dependent variable GDP.

Coefficient of Determination Test

The value of R-Squared is 0.9998 or 99.98%. This means that the independent variable can explain the dependent variable by 99.98%, while 0.02% is explained by other variables outside the model.

5. Conclusion

Based on research, data processing and hypothesis testing, it can be concluded that the digital economy has a significant influence on GDP. Based on the partial t test, the variables people Use Internet and Mobile Phone Subscriber individually have a significant influence on GDP. Meanwhile, the individual Broadband Internet Subscriber variable has no influence on GDP. Based on the simultaneous F test, all independent variables together have a significant influence on GDP. The results of the coefficient of determination test show that 99.98% of the independent variables can explain the influence on GDP, while 0.02% is explained by other variables outside the model. So the digital economy has a positive and significant influence on GDP in ASEAN countries.

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