Quantitative Economics and Management Studies (QEMS) *ISSN: 2722-6247 (online)*
Vol. 4 No. 6 (2023)
https://doi.org/10.35877/454RI.qems1982

Analysis of Digital Economy Determinants in Indonesia

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Abstract

The aims of this research is to determine the digital economy in Indonesia which consist of e-commerce, financial technology, and the number of internet users. This research was descriptive statistical method and using panel data regression model. The period of this research starts from 2020-2022 with cross-sectional data from 34 provinces in Indonesia. The data was collected from the Central Bureau of Statistics and East Ventures. The results of this study indicate that e-commerce has a positive and significant effect on the digital economy, financial technology has a positive and significant effect on the digital economy, the number of internet users has a positive and insignificant effect on the digital economy in Indonesia. This research provides a new insight of the role of e-commerce in economic growth and the importance of government policy and intervention in promoting local products on various e-commerce platforms. The low level of digital literacy in Indonesia required the role of academics and practitioners to participate in establish a smart technology society.

Keywords: digital economy, e-commerce, financial technology, the number of internet users

Received: 28 August 2023 Revised: 13 October 2023 Accepted: 21 December 2023

1. Introduction

The Digital Economy has a very important role in contributing to driving the economy in the future as it is one of the driving factors in economic growth in Indonesia. Covid-19 has put most of the business people in a slump. Many companies are forced to move employees to work from home (Brynjolfsson et al., 2020) . The transition to work form home requires technological solutions - IT infrastructure development, security systems, communications, electronic task management and implementation tracking. In the other hand, pandemic provides valuable lessons for business world to use an advanced technology to their bussines. Covid-19 accelerated the digitalization of the economy in Indonesia. the development of the digital economy in Indonesia is very rapid (Nizar & Sholeh, 2021) . The contribution of the Digital Economy to Economic Growth in Indonesia has increased significantly, from 3.66 percent in 2019 to 6.04 percent in 2021 (Google et al., 2022) . Factors driving the accelerated growth of the digital economy include: the demographic bonus of Indonesia's population, the number of Internet users, the rapid development of digital platforms such as e-commerce, financial technology and others. The digital economy sectors that are experiencing rapid growth are e-commerce and financial technology. The Internet users, there was an increase of 3.85 percent in January 2023 compared to the same month in 2022. The digital economy is promoted by the government, which is the application of the new economy concept which specifically leads to transactions of goods and services through internet media or known as with the term e-commerce. The digital economy sectors that are experiencing rapid growth are e-commerce and financial technology. E-commerce is evidence of technological developments in economy, namely through the use of the internet in production activities. The number of Internet users has increased by 3.85 percent in January 2023 compared to the same month in 2022. The digital economy is not only synonymous with startup companies and e-commerce, but this also includes various entities that were previously well-established with conventional working methods and now turning to digital such as Financial Technology. Fintech makes it easy to use and take advantage of various digital financial services (Fajar & Larasati, 202; Tanjung & Siswanto, 2022).

The problem is that even though the potential for digital economic activity is enormous, the contribution of the digital economy to GDP is still relatively low, which is below 10 percent. The use of the internet is currently dominated for

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social media activities only (Strogonova & Novikova, 2020;Ruhmi & Tanjung, A.A., 2023), not for business activities. Based on the description, research on the determinants of the Digital Economy in Indonesia is very important to understand the factors that influence the development of the Digital Economy in Indonesia. Research question in this study are:

- Does the Number of Internet Users affect the Digital Economy in Indonesia?
- Does E-Commerce affect the Digital Economy in Indonesia?
- Does Financial Technology (Fintech) affect the Digital Economy in Indonesia?

2. Literature Review

The Digital Economy has a very important role in contributing to driving the economy in the future and is one of the driving factors in economic growth in Indonesia. digital economy will represent all the broad applications of digital technology plus the production of digital technology (Bukht & Heeks, 2017) . Several previous studies that have conducted research related to the digital economy are: research on the factors that influence the utilization of the digital economy in SMEs in Jambi City using the binary logit regression estimation method shows that the factors that influence MSMEs in utilizing the digital economy are the variable type of business , information technology training, partnerships, age, education level and internet network (Umiyati & Achmad, 2021) . The results of research conducted by (Shinkevich et al., 2021) show that there is a positive correlation between government performance and the digital economy, the network readiness index also has a correlation with the digital economy. The results of research conducted by (Aprilia et al., 2021) show that E-Commerce has a significant effect on economic development during the Covid-19 period. Meanwhile, according to research conducted by (Nasution et al., 2020) states that the Total Value of e-Commerce Transactions (JNTE) has a positive and significant effect on economic growth in the digital era, other variables GDP and Number of Internet Users (JPI) have a positive and significant effect on Economic Growth in the digital era in Indonesia. In addition to the variables above, based on research conducted by (Ilman et al., 2019) using a qualitative method, it was found that financial technology also has a contribution to the economy. The digital economy has a positive and significant effect on economic growth (Tanjung et al., 2022)

3. Research Method and Materials

This study used data panel regression analysis to analyse the effect of variables. Data panel is a data set (several observations) that contains individual sample data carried out over several time periods (Tanjung & Muliyani, 2021) . This study uses secondary data, namely data obtained from the publications of the Central Bureau of Statistics (BPS) and East Ventures. The research was conducted using panel data formed from 2020-2022 and 34 Indonesian Provinces. the variable used in this study is the digital economy (ED) as the dependent variable proxied by the Digital Competitiveness Index (DCI)/ Digital Competitiveness Index, E-Commerce Transactions (ECOM) as a proxy for the Ratio of Population Using the Internet in Employment for Website/E-commerce Sales , Financial Technology (FIN) and Number of Internet Users (JPI) as independent variables. There are several advantages of panel data, including: Being able to take into account the level of individual heterogeneity, Can be used to test and build more complex models, Can reduce omitted-variables problems in data, More informative, more varied because of the increasing number of observations, Being able to minimize collinearity between variables and increasing the degree of freedom. The research model is briefly written as follows:

$$ED_{it} = \alpha + \beta_1 ECOM_{it} + \beta_2 FIN_{it} + \beta_3 JPI_{it} + \varepsilon_{it} \quad (1)$$

with:

i :Provinces in Indonesia
t : 2020, 2021, 2022
ED : Digital Economy
ECOM : Number of E-Commerce Transactions
TP : Number of Financial Technology (Fintech) Transactions
JPI : Number of Internet Users

Before estimating the model, the classical assumption test is carried out, but not all classical assumption tests are carried out, autocorrelation only occurs in time series data so panel data is unnecessary. So that the classical assumption test that was carried out was only the Multi-collinearity and Heteroscedasticity tests. Multi-collinearity test to see whether there is a strong correlation between the independent variables in forming a model (equation), Multi-collinearity is

highly not recommended, because it will impact the accuracy of parameter estimation. The way to identify whether there is multi-collinearity is to look for the value of the correlation coefficient between the independent variables, if the coefficient value is greater than 0.9, it can be concluded that the data is infected with multi-collinearity problems. The heteroscedasticity test is used to see whether the residuals of the model formed have a constant variance or not. A good model is a model that has a constant variance of each disturbance or residual. The way to identify whether there is heteroscedasticity is to use the Glejser test. Namely by regressing ab(e) with the independent variable. If the p-value of the independent variable is greater than the alpha level of 0.05, it can be said that the model is free from heteroscedasticity problems.

There is three approach Which used in estimate parameterpanel data regression models, namely the Common effects approach, Fixed effects and Random effects (Baltagi, B., 2005) .

a) Common effect model all data were combined whether it is cross section or time series data, regardless of time and place of research. This method assumed that the value of intercepts of each variable is same, so does the slope coefficient for all unit cross sections and time series. The common effect model equation is written as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \varepsilon_{it} \quad (2)$$

b) Fixed effect model is a regression method which estimates panel data by adding a dummy variable. This model assumes that there were different effect between individual. The difference can accommodated through difference in intercept. Therefore, in a fixed effect each model individual is an unknown parameter and will be estimated with dummy variable so this method called with Least Square Dummy Variables. The structure of the model is written as follows:

$$Y_{it} = \alpha_1 + \alpha_2 D_2 + ... + \alpha_1 D_{1+} \beta_1 X_{1it} + \beta_2 X_{2it} + ... + \beta_k X_{kit} + \varepsilon_{it} \quad (3)$$

c) Random effect model will estimate data panel Where variable disturbancemay be interconnected over time or between individuals. On fixed effects models can cause problems, one of which is the reduced degrees of freedom. Which caused on subtraction efficiency parameters, so that a random effect appears model that aims to overcome problem Which generated by fixed effect model. In general, the random effect model equation is written as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \varepsilon_{it}\,;\, \varepsilon_{it} = \mu_i + v_t + w_{it} \quad (4)$$

Chow test and Hausman -test were used to select the best model for the regression. On the Common model effect model if the chosen one is the fixed effect model then proceed with the Hausman test.

4. Results and Discussion

At this stage a descriptive analysis was carried out for each variable before further analysis was carried out. A summary of the descriptive results can be seen in table 1.

Table 1. Descriptive statistical test results

Statistics test	variables			
	Log(ED)	Log(ECOM)	Log(FINTEC)	Log(JPI)
Mean	3.53626	2.627593	7.58039	4.371478
Median	3.496508	2.677585	7.398673	4.40623
Maximum	4.382027	4.60517	11.90042	4.558498
Minimum	2.995732	-0.10536	4.330733	3.55934
Std. Dev.	0.262397	0.90432	1.681213	0.170515
Skewness	0.863147	-0.31594	0.558677	-3.20572
kurtosis	4.097451	3.495969	2.982968	15.63025
Jaque-Bera	17.78409	2.742315	5.307267	852.6771
Observations	102	102	102	102

Source: secondary data (processed), 2023

The number of observations in this study was 102, consisting of 34 units of cross section (Province) and 3 units of time series. On average the Digital Economy (ED) variable for 34 Provinces in an internal 3 year is 35.62 with a standard division of 10.7. This low standard division value indicates that the provincial digital economy gap in Indonesia is getting smaller. The province with the highest digital economy index is the Capital Region of Jakarta with a digital economy index of 73 in 2020 and rises to 80 in 2022, while the province with the digital economy index is Papua with

a digital economy index of 20 in 2020 and rises to 25 in 2022. Apart from using standard divisions, descriptive analysis is also used using the coefficient of variation. The coefficient of variation is the percentage of standard deviation with the Mean, which is used to test the level of variability of the data used in the study. Based on the calculation results, the variation in Digital Economic Value (ED) is 7.42 percent, the coefficient of variation in E-commerce (ECOM) is 34.4 percent, the coefficient of variation in financial technology (FINTEC) is 22.17 percent and the number of residents who use the internet (JPI) has a variation of 3.90. percent. This shows that the data on the Number of Population Using the Internet (JPI) is more homogeneous.

4.1. Selection of the Panel Data Model

The next step is to select the best model for panel data. The models being compared are the Common Effect Model (CEM) and the Fixed Effect Model (FEM), namely by using the Chow test, based on table 2 it can be seen the results of the Chow test.

Table 2. Chow test results

Effect Test	Statistics	df	Prob.
Cross-section F	9.000583	(33,65)	0.0000
Chi-square cross-sections	175.1656	33	0.0000

Source: secondary data (processed by eviews 12), 2023

From table 2 it can be seen that Prob. Cross Section F of 0.000 is less than 0.05, then Ho $_{is}$ rejected so that in conclusion the selected model is FEM (Fixed Effect Model).

Table 3. Hausman test results

Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.
Random cross-sections	6.608193	3	0.0855

Source: secondary data (processed by eviews 12), 2023

From table 3 it can be seen that the *probability* value **(Prob.)** for a random cross-section of 0.0855 is greater than 0.05, then H $_{o}$ is accepted so that it can be concluded that the chosen model is REM (Random Effect Model).

4.2. Classic Assumption Test

The next stage is to test the classical assumptions. Considering that the selected model is *the Random Effect Model* (REM) which uses GLS estimation, the classic assumptions to be tested are the assumptions of normality and multicollinearity. Empirical normality testing was carried out using the Jarque Berra test. The results of the normality test are shown in table 4, namely:

Table 4. Normality test

Jarque Berra	4.070739
probability	0.130632

From table 4 it can be seen that the results of the Jarque Berra test with a value of 4.070739 with a probability value of 0.130632 is greater than 0.05, then Ho is $_{accepted}$ so that it can be concluded that with a significance level of 5 percent, sufficient evidence states that the model is normally distributed. The next test is multicollinearity, to check this assumption, it is done by looking at the results of the correlation between the independent variables. Table 5 shows the results of the multicollinearity test.

Table 5. Multicollinearity test results

	Log(ECOM)	Log(FINTEC)	Log(JPI)
Log(ECOM)	1	0.776746	0.687476
Log(FINTEC)	0.776746	1	0.51292
Log(JPI)	0.687476	0.51292	1

Source: secondary data (processed by eviews 12), 2023

Based on the results of the multicollinearity test in table 5, it can be seen that the correlation value between the variables is below 0.9, meaning that it can be concluded that there are no symptoms of multicollinearity.

After the model meets the classical assumption test, then the REM panel data regression model is followed. The following table shows the results of the REM model.

Table 6. REM Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistics	Prob.
C	2.013093	0.456159	4.413137	0.0000
LOG(ECOM)	0.108844	0.022987	4.735037	0.0000
LOG(FINTEC)	0.065633	0.012523	5.24112	0.0000
LOG(JPI)	0.169198	0.116567	1.451507	0.1498
R-squared	0.739976		F-statistic	92.96255
Adjusted R-Squared	0.732016		Prob(F-statistic)	0.000000
Dependent variable:	Log(ED)			

Source: secondary data (processed by eviews 12), 2023

Table 6 presented the results of the estimation of the panel data model with the Random Effects (REM) model which has fulfilled the classic assumption test. to see the goodness of this research model can be seen from the coefficient of determination. The coefficient of determination or R^2 of this research model is 73.9 percent. This means that 73.9 percent of the independent variables are able to explain variations in changes in the dependent variable, while the rest are explained by other variables not included in this study. Simultaneously, the selected model shows that the p-value of the F test is 0.000000 which is smaller than the significance value of α (0.05). it can be concluded that reject H_o which means that at a significance level of 5 percent there is sufficient evidence that the independent variables have a significant influence on the dependent variable. Thus the determinant model of the digital economy in Indonesia is considered to fulfill the goodness of fit. Based on the results in table 6, the regression equation can be written as follows:

$$\text{Log(ED)} = 2.013093 + 0.108844*\log(\text{ECOM}) + 0.065633*\log(\text{FINTEC}) + 0.169198*\log(\text{JPI}) \quad (5)$$

Furthermore, the partial statistical test results show that the E-commerce variable (log(ECOM)) has a coefficient of 0.108844 and a p-value of 0.0000 which is less than 0.05. meaning that the E-commerce variable has a positive and significant effect on the digital economy in Indonesia. The Financial Technology variable (log(FINTEC)) has a coefficient of 0.065633 and the p-value of 0.0000 is less than 0.05. meaning that the financial technology variable has a positive and significant effect on the digital economy in Indonesia. The variable Number of Internet Users (log(JPI)) has a coefficient of 0.169198 and p- value of 0.1498 greater than 0.05. this means that the variable Number of Internet Users has a positive but not significant effect on the digital economy in Indonesia.

Based on table 7 it can be seen that each province has heterogeneous characteristics, this can be seen from the different intercept coefficients.

Table 7 presented the highest intercept or constant values are in Jakarta, Yogyakarta and West Java. This means that the digital economy level in the three provinces has the highest average. From a period of 3 years (2020-2022) Jakarta Province ranks first in the digital economy while Yogyakarta ranks second. The lowest intercept/constant value is seen in Lampung province. This means that Lampung is a province that has low digital economy movement during the 2020-2022 period.

4.3. The Influence of E-commerce on the Digital Economy in Indonesia

Based on the partial statistical test results, it can be seen that E-commerce has a positive and significant influence on the digital economy in Indonesia. If there is a 1 percent increase in E-commerce, it will cause an increase in the digital economy in Indonesia by 0.108844 percent. Vice versa, if there is a 1 percent decrease in E-commerce it will cause a decline in the digital economy in Indonesia by 0.108844 percent. The results of this study are in accordance with (Fadhillah, 2019) which also state that e-commerce has a positive effect in driving economic growth, especially in Micro, Small and Medium Enterprises (MSMEs). This research is also in line with studies (Nasution et al., 2020) which states that E-commerce has a positive and significant effect on economic growth in the digital era.

This findings in accordance with (Salsabilla & Ardhiyansyah, 2021) which states that e-commerce has a significant influence on economic development. This finding is also in line with (Tanjung et al., 2022) which states that e-commerce has a positive and significant effect on economic growth. With e-commerce, MSMEs can expand market reach and increase sales. In 2021 in Indonesia, E-commerce will contribute $53 billion (Fai, 2023) .

Table 7. Effects and Cros s-section constants

No.	Province	Effect	Constant
1	Aceh	-0.04944	1.963652
2	North Sumatra	-0.09543	1.917666
3	West Sumatra	-0.0153	1.997798
4	Riau	-0.13937	1.873726
5	Jambi	-0.11795	1.895148
6	South Sumatra	-0.13794	1.875156
7	Bengkulu	0.03436	2.047453
8	Lampung	-0.16379	1.8493
9	Bangka Belitung	-0.05748	1.955614
10	Riau Islands	0.010006	2.023099
11	Jakarta	0.283321	2.296414
12	West Java	0.109487	2.12258
13	Central Java	-0.01125	2.001839
14	Yogyakarta	0.135061	2.148154
15	East Java	0.088649	2.101742
16	Banten	-0.03074	1.982349
17	Bali	0.07357	2.086663
18	NTB	-0.08609	1.927005
19	NTT	0.069661	2.082754
20	West Kalimantan	-0.13819	1.874906
21	Central Kalimantan	-0.01248	2.000609
22	South Kalimantan	-0.05682	1.956273
23	East Kalimantan	0.077686	2.090779
24	North Kalimantan	0.10818	2.121273
25	North Sulawesi	-0.03132	1.981769
26	Central Sulawesi	-0.02613	1.986961
27	South Sulawesi	0.024729	2.037822
28	Central Sulawesi	0.041532	2.054625
29	Gorontalo	0.047201	2.060294
30	West Sulawesi	-0.08026	1.932832
31	Maluku	0.086969	2.100062
32	North Maluku	0.0331	2.046193
33	West Papua	-0.02313	1.98996
34	Papua	0.049599	2.062692

Source: secondary data (processed by eviews 12), 2023

4.4. The Influence of Financial Technology on the Digital Economy in Indonesia

The Financial Technology variable has a positive and significant influence on digital economy variables in Indonesia. If there is a 1 percent increase in financial technology, it will cause an increase in the digital economy in Indonesia by 0.065633 percent. Vice versa, if there is a 1 percent decline in financial technology, it will cause a decline in the digital economy in Indonesia by 0.065633 percent. The results of this study are in line with the study (Sihombing, 2021) which states that financial technology has a positive and significant influence on a country's economic growth. Fintech can accelerate digital economic growth by expanding access to digital financial services.

4.5. The Effect of the Number of Internet Users on the Digital Economy in Indonesia

The variable number of internet users has a positive but not significant influence on the digital economy in Indonesia with a coefficient of 0.169198. This result is contrary to the findings (Nasution et al., 2020) which states that the number of internet users has a positive effect on economic growth. This finding is due to the fact that the high number of internet users is in contrast to the digital literacy of the Indonesian people which is still low. Low digital literacy can hinder the full use of the potential of the digital economy and reduce its impact on economic growth. Nationally, Indonesia's digital literacy index in 2022 is 3.54 on a scale of 1-5 (Agustini, 2023) . Internet users in Indonesia use the internet more to find information, find ideas and inspiration, and communicate with family and others and based on websites accessed, the first order is google.com, followed by youtube.com, then detik.com and others (Riyanto , 2023) .

5. Conclusion

The increase in e-commerce, financial technology and the number of internet users can simultaneously increase the digital economy in Indonesia. The positive and significant relationship between e-commerce variables and the digital economy has a major contribution in shaping economic growth. Therefore, e-commerce is one of important aspect considered by the government. The government needs to encourage this digital e-commerce platform to sell products originating from products produced by MSMEs so that the added value generated can be felt by MSME and generally the Indonesian people. The positive and significant influence of financial technology variables on the digital economy shows that many producers and consumers are already taking advantage of financial technology today, but what needs to be considered is that there is currently a lot of fraudulent financial technology so that many consumers are ensnared with very high interest rates. for example when using loans through financial technology. The relationship between the number of internet users is not yet significant to the digital economy in Indonesia. This is because the high number of internet users is not in line with digital literacy which is still low, so that most internet users still use the internet to spend time not using the internet for digital-based entrepreneurship.

Acknowledgments

The author would like to thank the Directorate of Research, Technology and Community Service (DRTPM) Diktiristek Ministry of Education, Culture, Research and Technology and Tertiary Education Service Institution Region I which has provided the opportunity to take part in funding research programs for novice lecturers with contract numbers: 177/E5/PG.02.00.PL/2023 and 060/LL1/AL.04.03/2023.

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