International Journal of Management and Business Applied

Vol.4 No.1, 2025
e-ISSN: 2827-9840
PP.28-45

Digital Payment on Financial Transactions Towards Economic Growth in South East Asia Emergent Countries

Martino Wibowo[1] *, Faizul Mubarok [2], Saif Ur Rahman[3]
[1,2]Department Management, Graduate School, Universitas Terbuka, Indonesia
[3]International College, International Business Administration (IBBA), Siam University, Thailand
Email: [1]tino@ecampus.ut.ac.id, [2]faizul.mubarok@ecampus.ut.ac.id,[3]saif.ur@siam.edu

DOI: https://doi.org/10.54099/ijmba.v4i1.1299

ARTICLE INFO

Research Paper

Article history:
Received: 12 January 2025
Revised: 22 February 2025
Accepted: 24 March 2025

Keywords: Digital Payment, Financial Transaction, Economic Growth, ASEAN.

ABSTRACT

Purpose – The study aims to see how much digital payment activities influence ASEAN's economic growth from 2019 to 2024. The study applies to South East Asian (SEA) countries, including Indonesia, Thailand, Malaysia, the Philippines, and Vietnam. They are developing countries with stable growth and the potential to continue to grow and be digitized in business and financial transactions.
Methodology/approach – Using panel data analysis in five SEA countries, measuring appropriate models for data testing and the visualization in graphs stating correlations and transitions.
Findings – The study results found that almost all variables studied have an insignificant effect on economic growth, whereas they have a positive influence. This implies that digital payments have not yet fully boosted the region's economic growth, but have the potential for digital payments in financial transactions to grow rapidly along with public needs. However, the support of the business actors and public sectors is needed to expand the reach and services of electronic transactions.
Novelty/value – This article specifically discusses digital payments in ASEAN countries in terms of financial transaction activities. Additionally, there is a visualization design of digital payment growth transition and contributes to digital payment modelling in financial transactions against regional gross domestic product growth in Southeast Asian countries.

INTRODUCTION

ASEAN was experiencing steady economic growth, with some member countries being among the fastest-growing economies in the world. This growth was fueled by factors such as a young and dynamic workforce, an expanding middle class, and an increasing focus on innovation and entrepreneurship. The ASEAN Economic Community (AEC) was established in 2015 to create a single market and production base within the region. This aimed to facilitate the flow of goods, services, investments, and skilled labour across ASEAN member states (Tran et al., 2022).

There were ongoing discussions and developments related to the potential adoption of a cashless

society in ASEAN (Association of Southeast Asian Nations) countries (Ha & Chuah, 2023; Hastuti & Jauhari, 2021; Menon, 2016). However, the specific progress and implementation may have evolved since then. There are some key points related to the cashless society and the development of economics in ASEAN, including digital Payment Adoption. Many ASEAN countries were experiencing a gradual shift towards digital payment systems, driven by factors like increasing smartphone penetration, improved internet connectivity, and the proliferation of fintech companies(Cheung & Taojun, 2023; Doheir, Talib, Harum, Abu, Al-Mhiqani, et al., 2019; Ying & Mohamed, 2020). This trend was particularly noticeable in emerging ASEAN countries like Malaysia, Thailand, Indonesia, and the Philippines.

The role of Digital Financial Transactions and Economic Growth in ASEAN Emerging Countries (Association of Southeast Asian Nations) has a significant impact on increasing financial accessibility, encouraging economic growth, and accelerating development in the region (Box & Gonzalez, 2017).

The use of electronic financial transactions, such as digital payments and electronic banking services, has opened up financial accessibility for many people in Emerging ASEAN countries. In many cases, this technology allows people who previously did not have access to traditional financial institutions to conduct financial transactions easily and safely(Tang et al., 2020). The adoption of digital financial transactions has helped reduce reliance on cash transactions in many Emerging ASEAN countries. This brings benefits to the economy, including reduced costs associated with processing and distributing cash and helping to address security concerns and risks associated with cash transactions (Cheung & Taojun, 2023).

Furthermore, the utilization of digital financial transactions also contributes to financial inclusion, as people who were previously unreachable by traditional financial institutions can now use financial services digitally (Chen & Ruddy, 2020). This helps increase economic participation and access to various financial services such as loans, insurance, and investment. In addition, digital financial transactions help improve business efficiency by reducing administrative costs, processing time, and human error associated with manual transactions(Gulati & Srivastava, 2007). On a larger economic scale, this efficiency can have a positive impact on national productivity and competitiveness (Aniqoh, 2020; Tailor, 2020; Wonglimpiyarat, 2014a). In many cases, the adoption of digital financial transactions contributes to the economic growth of ASEAN countries. The growth of the fintech sector and the financial technology startup ecosystem has created new jobs and driven innovation in the financial sector and other businesses (Kasemharuethaisuk & Samanchuen, 2023; Wonglimpiyarat, 2014b).

Several studies have examined the role of digital financial transactions in promoting economic growth in ASEAN countries. For example, a study by (Chea, 2021; Nguyen et al., 2020) investigated the impact of digital financial services on economic growth in ASEAN countries. The findings suggested that the adoption of digital financial services, such as mobile banking and e-wallets, positively influenced economic growth by enhancing financial inclusion and efficiency.

Another study by Ha & Chuah (2023) focused on the effects of digital payment systems on economic growth in ASEAN countries. The research highlighted that the increased usage of digital payment platforms, such as mobile banking and online payment systems, contributed to higher economic growth rates by reducing transaction costs, improving financial intermediation, and fostering entrepreneurship.

Furthermore, a study (Chia, 2017) examined the relationship between digital financial inclusion and economic growth in ASEAN countries. The findings indicated that improving digital financial

inclusion, through initiatives like expanding access to digital payment systems and promoting financial literacy, had a positive impact on economic growth by enhancing financial access, reducing income inequality, and stimulating entrepreneurship.

While the existing literature generally supports the positive relationship between digital financial transactions and economic growth in emerging ASEAN countries, it is important to note that challenges and barriers exist. These include issues related to cybersecurity, data privacy, regulatory frameworks, and infrastructure development. Addressing these challenges is crucial to fully harness the potential benefits of digital financial transactions for economic growth in the region.

Digital financial transactions have gained significant attention in recent years due to their potential impact on economic growth in emerging ASEAN countries. This literature review aims to explore the relationship between digital financial transactions and economic growth in this context.

Several studies have examined the role of digital financial transactions in promoting economic growth in ASEAN countries. For instance, a study by Yaqin & Safuan (2023) developed a model to measure financial inclusion by incorporating the evolution of digital finance and identified its relationship with GDP growth in emerging nations. The study discovered that the inclusion of digital finance enhances GDP growth in developing nations. Another study by (Ahmad et al., 2021) examined the impact of digital financial inclusion and human capital on China's provincial economic growth. The empirical findings showed that digital financial inclusion and human capital significantly affect China's provincial economic growth.

Furthermore, a study by Al-Own et al.(2023) investigated the impact of digital payment systems and blockchain on economic growth. The findings revealed a positive impact of digital payment on economic growth, suggesting that digital financial transactions play a significant role in promoting economic growth in emerging countries.

While the existing literature generally supports the positive relationship between digital financial transactions and economic growth in emerging ASEAN countries, it is important to note that challenges and barriers exist. These include issues related to cybersecurity, data privacy, regulatory frameworks, and infrastructure development. Addressing these challenges is crucial to fully harness the potential benefits of digital financial transactions for economic growth in the region.

In conclusion, the literature suggests that digital financial transactions play a significant role in promoting economic growth in emerging ASEAN countries. The adoption of digital financial services and payment systems can enhance financial inclusion, reduce transaction costs, improve financial intermediation, and stimulate entrepreneurship. However, further research is needed to explore the specific mechanisms and factors that drive the relationship between digital financial transactions and economic growth in the context of emerging ASEAN countries.

LITERATURE REVIEW

In Based on the literature review and available information, the following ASEAN countries have made significant progress in adopting digital financial transactions(Trujillo et al., 2018). For instance, as a leading financial hub in the region, Singapore has been at the forefront of digital financial transactions and fintech innovation. The country has a well-developed digital infrastructure, a supportive regulatory environment, and a high level of financial inclusion, which has facilitated the growth of digital financial services. Meanwhile, Malaysia has made considerable progress in promoting digital financial transactions, with a growing number of fintech companies and digital payment platforms (Doheir et.al.,2019). The country's central bank, Bank Negara Malaysia, has implemented various initiatives to support the development of digital financial services and enhance financial inclusion (Trujillo et al., 2018). Indonesia, as the largest economy in the ASEAN region, Indonesia has witnessed rapid growth in digital financial transactions, driven by a large unbanked population and

increasing smartphone penetration. The country has seen a surge in fintech startups and digital payment platforms, which have played a crucial role in promoting financial inclusion and driving economic growth (Aniqoh, 2020; Widjojo, 2020). Thailand has also made significant strides in adopting digital financial transactions, with the government and central bank implementing various initiatives to promote digital financial services and enhance financial inclusion. The country has a growing number of fintech companies and digital payment platforms, which have contributed to the expansion of digital financial transactions(Kasemharuethaisuk & Samanchuen, 2023; Wonglimpiyarat, 2014). Moreover, Vietnam has experienced rapid growth in digital financial transactions, driven by a large unbanked population, increasing smartphone penetration, and supportive government policies. The country has seen a surge in fintech startups and digital payment platforms, which have played a crucial role in promoting financial inclusion and driving economic growth (Tran et al., 2022). In the meantime, The Philippines has made progress in adopting digital financial transactions, with a growing number of fintech companies and digital payment platforms. The country's central bank, Bangko Sentral ng Pilipinas, has implemented various initiatives to support the development of digital financial services and enhance financial inclusion(General, 2023).

These countries have made significant progress in adopting digital financial transactions, which has contributed to their economic growth and financial inclusion. However, challenges and barriers still exist, such as cybersecurity, data privacy, regulatory frameworks, and infrastructure development. Addressing these challenges is crucial to fully harness the potential benefits of digital financial transactions for economic growth in the region(Avirutha, 2021).

This research also wants to add aspects of some of the research conducted by (Chen & Kimura, 2019; Ong et al., 2023; Pangestu & Lee-Makiyama, 2019; Yu & Chung, 2022) which contributes in the form of the role of digital payments made through the internet and other online systems to economic growth in the ASEAN region. In addition, this research has a significant impact on the development of start-ups (Ikhwan &; Rahadi, 2022) that participate in digital development and digitalization service competitions, especially in digital payment system development innovations.

METHOD

This research is quantitative research using panel data testing on five countries are emerging economic nations in Southeast Asia consisting of Indonesia, Thailand, Malaysia, Vietnam, and the Philippines. The data used are secondary data obtained from financial transaction reports using digital gateway payment traffic, transactions using online modes via the internet and transactions using smartphones and economic growth data. The analysis method used is spatial and descriptive panel data regression which supports the results of the study. The advantage of using panel data is that it is better at measuring and identifying effects that cannot be detected when using data cross-section or pure time series, providing more and more diverse information, minimizing the problem of collinearity, increasing the number of free degrees so that it is more efficient, and being able to control individual heterogeneity, in this case, countries in Southeast Asia.

The analysis steps to be carried out are as follows:((i)Data Exploration. Start by exploring your data set to understand its structure, the types of variables, and the range of values in each column. This study measurement uses tools like pandas in Python to load and explore the data. (ii) Data Cleaning. Checking for missing values, duplicates, and outliers. Handle any data quality issues and perform necessary imputations or removal of problematic data points. (iii) Descriptive Statistics. Calculate basic descriptive statistics for numerical variables, such as mean, median, standard deviation, minimum, maximum, etc. This will give an overview of your data's central tendency and spread. (iii) Data Visualization. Create visualizations (e.g., bar plots, histograms, scatter plots) to understand the

distribution and relationships between variables. Visualization helps in identifying patterns and trends in the data, and (iv) Hypothesis Testing. The specific research questions or hypotheses, perform statistical tests to determine if there are significant differences or relationships between variables. (v) Interpretation of Results. After analyzing the data and running any necessary tests or models, interpret the results and draw conclusions based on the findings.

To normalize the data, we apply Min-Max normalization to each numerical column (excluding the "Country" and "Year" columns) so that the values are scaled between 0 and 1.
Min-Max normalization formula:

$$Xnorm = \frac{X - Xmin}{Xmax - Xmin} \quad (1)$$

Where:

- *X* is the original value
- *Xmin* is the minimum value of the column
- *Xmax* is the maximum value of the column
- *Xnorm* is the normalized value

Let's proceed with the normalization:

1. Find the minimum and maximum values for each column.
2. Apply the Min-Max normalization formula to each data point in the columns.

After normalizing the data, it will be easier to compare and analyze the values across different columns. After the data were normalized, the data should be tested in terms of the validity and reliability of the data gathered.

Panel data involves collecting data on the same set of entities (e.g., individuals, firms, countries) over multiple periods. Let's denote the number of entities as "N" and the number of periods as "T."
Dependent Variable: Let "Y_{it}" represent the dependent variable for entity "i" at time "t."
Independent Variables: Let "X_{it}" represent a vector of independent variables for entity "i" at time "t."

Individual-Specific Fixed Effect: The FE model includes an individual-specific fixed effect, denoted as "αi." This captures the unobserved heterogeneity that is specific to each entity and remains constant over time.
Error Term: The error term, denoted as "εit," represents the unobservable factors that affect "Y_{it}" but are not accounted for by the model.
The mathematical Formulation of the Fixed Effects Model of this study is:

$$Yit = \alpha i + X_{it}'\beta + \varepsilon_{it} \quad (2)$$

where:

Y_{it} is the dependent variable for entity "i" at time "t"
α_i is the individual-specific fixed effect for entity "i"
X_{it} is a vector of independent variables for entity "i" at time "t"
β is a vector of coefficients representing the effect of the independent variables on the dependent variable.
ε_{it} is the error term..

All the data set is converted in log natural (ln) value. The process of normalization aims to rescale values to fit into a specific range, often between 0 and 1, to better handle different scales among features in a dataset. It constitutes LGDPG=ln(GDP); LMRDG= ln (MRDG); LMDP= ln (RDP); LUMPIBUY=ln (UMPIBUY); LUMPIBILL= ln(UMPIBILL); LUMPIMON= ln (UMPIMON), then the equation model was defined as:

$$Y_{it} = \alpha + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \beta_4 X4_{it} + \beta_5 X5_{it} + \beta 6 X6_{it} + \varepsilon_{it}. \quad (3)$$

The definitions for each column in the dataset are as follows:

Y=`LGDPG`: This stands for Gross Domestic Product. It represents the rate of growth of the gross domestic product in a particular country for a specific year. It's a measure of economic performance.
X1= `LMRDG`: This stands for Made or Received a Digital Payment. It represents the percentage of individuals aged 15 and above who made or received a digital payment in a specific year.
X2=`LMDP`: This stands for Made a Digital Payment. It represents the percentage of individuals aged 15 and above who only made a digital payment in a specific year.
X3=`LRDP`: This stands for Received Digital Payments. It represents the percentage of individuals aged 15 and above who only received a digital payment in a specific year.
X4=`LUMPIBUY`: This stands for Used a Mobile Phone or the Internet to Buy Something Online. It represents the percentage of individuals aged 15 and above who used a mobile phone or the Internet to buy something online in a specific year.
X5=`LUMPIBILL`: This stands for Used a Mobile Phone or the Internet to Pay Bills. It represents the percentage of individuals aged 15 and above who used a mobile phone or the Internet to pay bills in a specific year.
X6=`LUMPIMON`: This stands for Used a Mobile Phone or the Internet to Send Money. It represents the percentage of individuals aged 15 and above who used a mobile phone or the Internet to send money in a specific year.

These variables provide insight into the economic growth of a country and the adoption of digital payment methods by its residents**.**

The Chow test, Haussman Test and Jarque-Berra test were used to estimate whether the model has a Fixed or random effect. The Chow test is used to determine whether the coefficients in two linear regressions on different data sets are equal. The Hausman test is used to determine whether the fixed effects (FE) or random effects (RE) model is more appropriate for panel data analysis. As part of that, the Breusch-Pagan test is used to test for heteroscedasticity in a linear regression model. It tests the null hypothesis that the error variances are all equal (homoscedasticity) versus the alternative hypothesis that the error variances are not equal (heteroscedasticity).

In this case, both the p-values for the LM test and the F test are well above 0.05. This means that we do not have enough evidence to reject the null hypothesis of homoscedasticity. In other words, the test does not detect heteroscedasticity in this model. Nonetheless, this does not necessarily mean that the model is free from any other issues. It's always a good idea to check for other potential issues like multicollinearity, autocorrelation, and specification errors. Also, keep in mind that this is a simple OLS model, not a panel data model, so it doesn't account for any possible within-country or within-year correlations.

The fixed effects model estimates both the individual-specific fixed effects (αi) and the coefficients (β) using the method of Least Squares Dummy Variables (LSDV) or Fixed Effects Estimation. The general idea is to introduce dummy variables for each entity and estimate the model with these dummy variables to capture the individual-specific fixed effects. These dummy variables take a value of 1 for the corresponding entity and 0 for all other entities. In addition, the estimation aims to find the values of αi and β that minimize the sum of squared errors (the difference between the observed Y_{it} and the predicted Y_{it} based on the model).

In regards to the Interpretation of Results. The coefficients (β) represent the average effects of the independent variables on the dependent variable across all entities.
The individual-specific fixed effects (αi) represent the differences in the intercept (or constant term) for each entity compared to the reference entity (usually the first entity in the data).

Panel Data Assumptions: The validity of the FE model relies on certain assumptions, including (i) No perfect multicollinearity among the independent variables. (ii) No endogeneity (i.e., the error term is not correlated with the independent variables). (iii)Homoscedasticity (constant variance of the error term) and no serial correlation (independence of errors over time).

Once a model is selected, then the parameters of that model should be estimated. Therefore, various estimation techniques are used, such as Ordinary Least Squares (OLS), Maximum Likelihood

Estimation (MLE), or Generalized Method of Moments (GMM). After ensuring that the model has met all the necessary assumptions, you can perform a hypothesis test to determine whether the independent variable has a significant effect on the dependent variable. The final stage is to interpret the results of the analysis that has been done. This includes understanding how the independent variable affects the dependent variable and how these results are relevant to the study.

Hypothesis

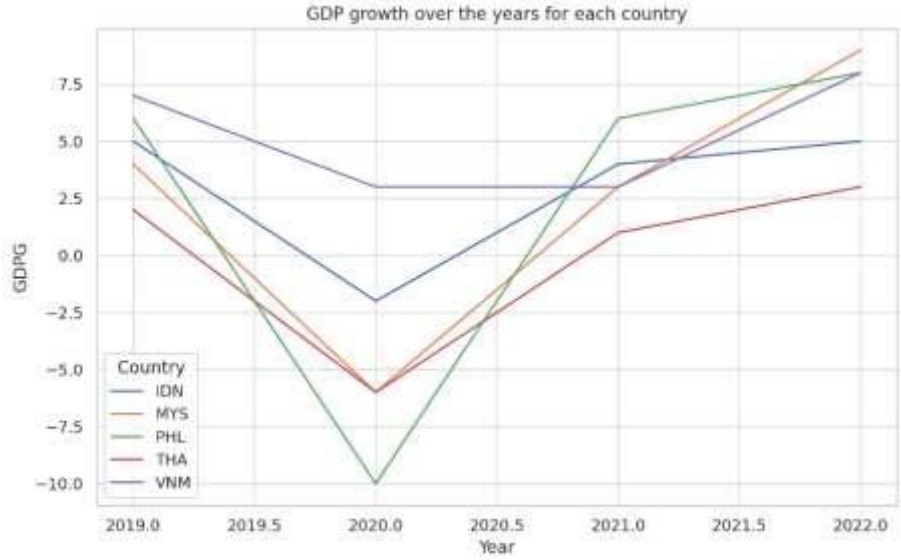
H1: Made or Received a Digital Payment significantly affects economic growth in ASEAN
H2: Only Made a Digital Payment significantly affects economic growth in ASEAN
H3: Only Received Digital Payment significantly affects economic growth in ASEAN
H4: Using a Mobile Phone or the Internet to Buy Something Online affects economic growth in ASEAN
H5: Using a Mobile Phone or the Internet to Pay Bills Online affects economic growth in ASEAN
H6: Using a Mobile Phone or the Internet to Send Money affects economic growth in ASEAN

RESULT AND DISCUSSION

Result

In this study, the results will be visualized in the form of diagrams and tables. Here is the line plot showing the GDP growth over the years for each country. Each line represents a different country. Table 1 indicates how GDP growth has changed over time for each country in the dataset provided.

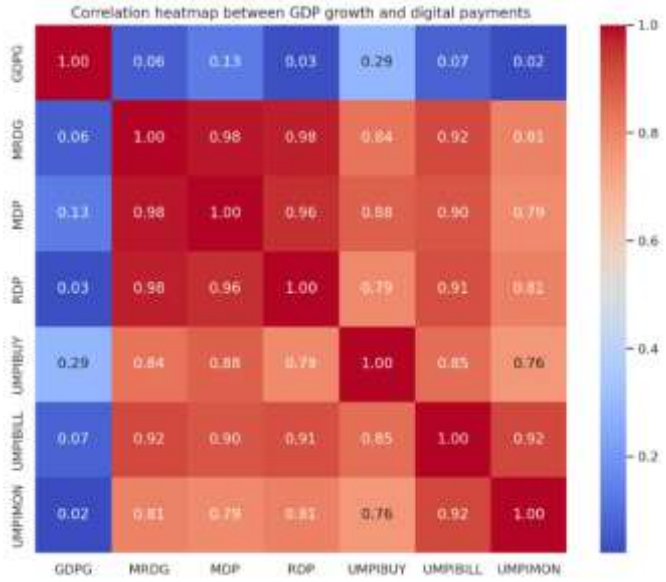
Table 1. GDP Growth of ASEAN



Source: Worldbank, 2024

Table 2 shows the correlation heatmap visualizes the correlation coefficients between GDP growth and the different types of digital payments. The colour and the number in each cell represent the correlation coefficient between the two variables: a value close to 1 means a strong positive correlation, a value close to -1 means a strong negative correlation and a value close to 0 means no correlation.

Table 2 Correlation Between Economic Growth and Digital Payments

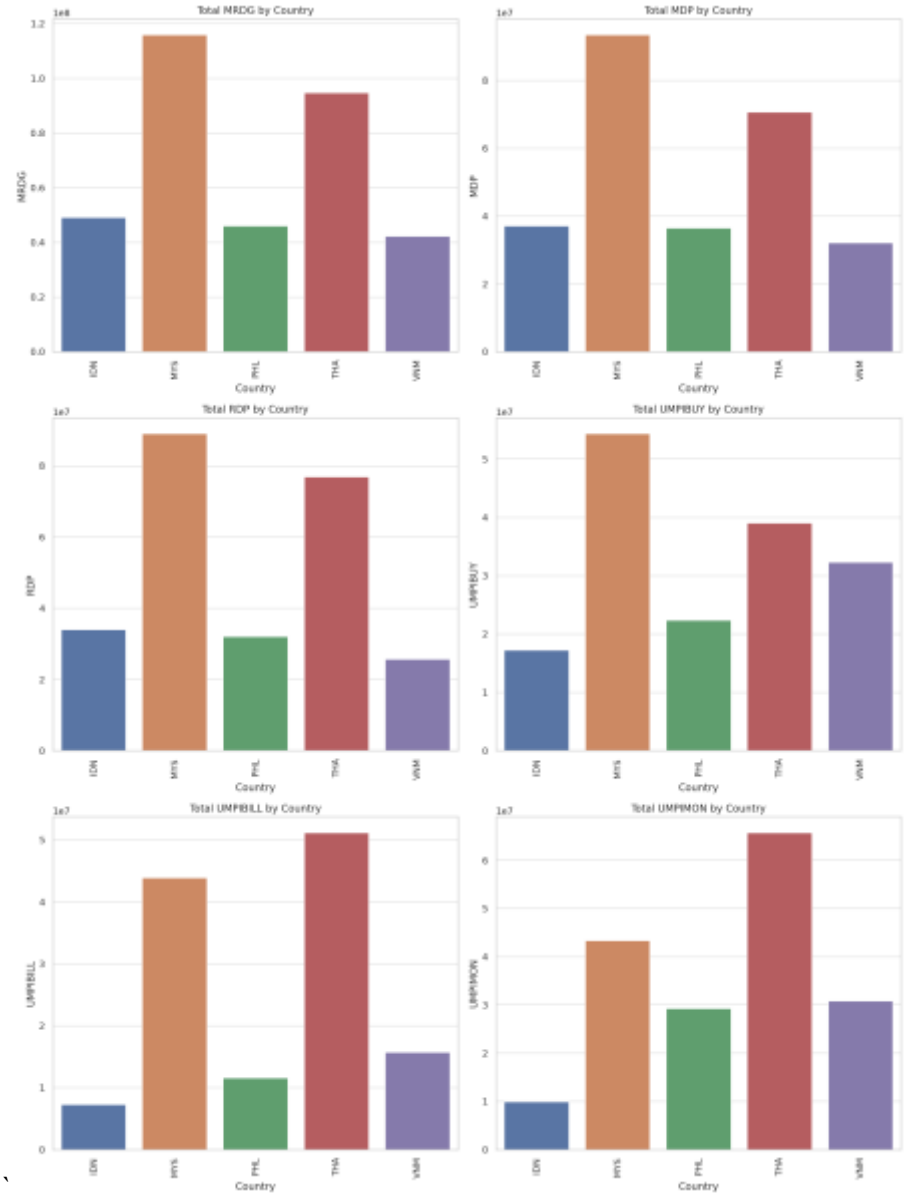


Source: Author Estimation Using Phyton Programming

Now, let us move on to the next visualization. Bar plots of the different types of digital payments for each country. Particularly for this, we create a bar plot for each type of digital payment. Aggregated data by country to get the total value for each type of payment for each country were taken into account.

Below is the bar plots showing the different types of digital payments for each country. Each plot represents a different type of digital payment, and the bars represent the total values for each country in the dataset.

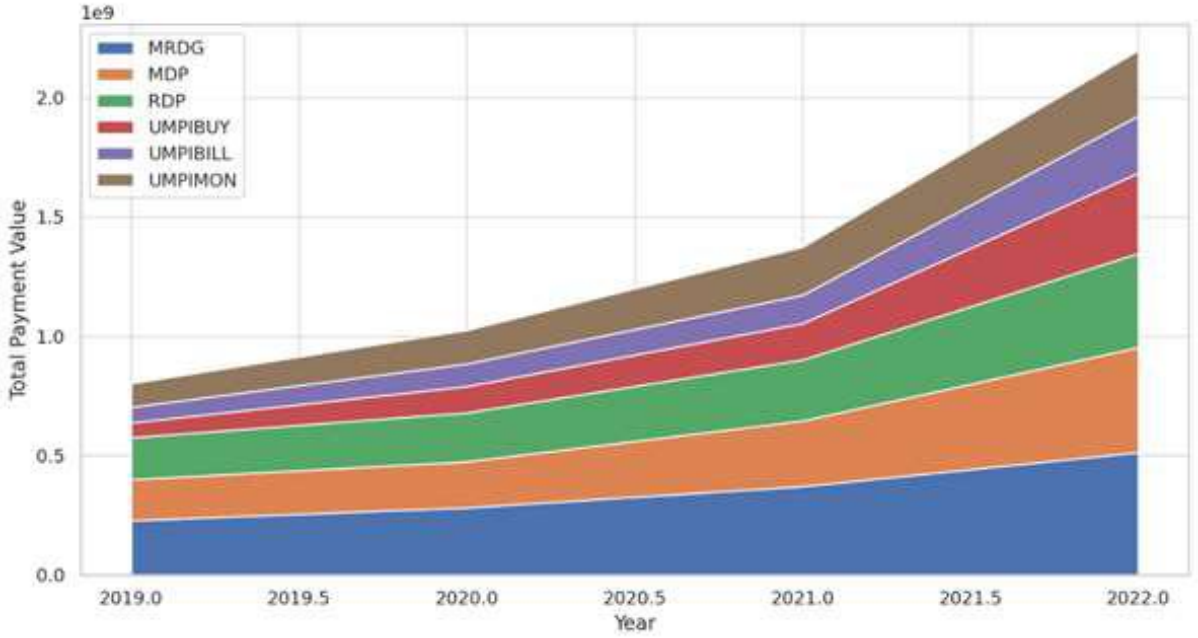
Figure 1 Different Types of Digital Payments of Each SEA Countries



Source: Author Estimation

Figure 2 exhibits a stacked area chart showing the change in types of digital payments over time. For this, aggregative data by year were considered to get the total value for each type of payment for each year.

Figure 2 Change in Types of Digital Payments Over Time



Source: Author Estimation

The diagram above is the stacked area chart showing the change in types of digital payments over time. Each colour represents a different type of digital payment, and the size of each coloured area represents the total value of that type of payment for each year. This visualization provides an overview of how the usage of different types of digital payments has evolved.

Subsequently, from the descriptive analysis, the following findings were obtained:

Table 3 Descriptive Analysis

index	GDPG	MRDG	MDP	RDP	UMPIBUY	UMPIBILL	UMPIMON
count	200	200	200	200	200	200	200
mean	2.7	69578081.8	53965189.6	51546146.3	34619062.9	32905448.0	38140866.1
std	5.1	39734444.8	35235946.1	34879228.1	25509433.7	20500552.6	23543295.4
min	-10.0	17211801.6	10327081.0	8605900.8	8605900.8	5743876.2	8605900.8
0.3	1.8	38538398.1	27233986.4	28366536.3	16666590.3	16223770.5	20654161.9
0.5	3.5	61431714.1	41906709.2	38214072.8	25659477.5	34423603.2	34423603.2
0.8	6.0	100376590.0	75313608.1	77857448.3	52023670.0	43489033.4	51635404.8
max	9.0	158392701.7	137917979.7	143771301.9	87734923.7	80783920.9	102785869.2

Source: Author Estimation Using Phyton Programming

Referring to Table 3, if compared to the other five countries in ASEAN, Malaysia has the highest average value and max value of all aspects of digital payments in financial transactions. While the lowest is Vietnam.

Model Assumption Measurement

In this case, after splitting the data into two sets at the midpoint and performing the Chow test. The results obtained are the following: F statistic: 0.3936 with p-value: 0.8760.
The high p-value suggests that we cannot reject the null hypothesis that the coefficients of the two regressions are equal. This means that there is not a significant difference in the relationships between the two halves of the data.

Here are the results of the Model Comparison between Random Effect (RE) and Fixed Effect (FE). The R-squared values are the same for both the random effects and fixed effects models, indicating that both models explain the same amount of variation in the dependent variable. The F-statistic and its p-value are also the same for both models.

Table 4 Model Comparison Between Random Effects and Fixed Effect Model

Model	**RE**	**FE**
Dep. Variable	GDPG	GDPG
Estimator	RandomEffects	PanelOLS
No. Observations	20	20
Cov. Est.	Unadjusted	Unadjusted
R-squared	0.3953	0.3953
R-Squared (Within)	0.3768	0.3768
R-Squared (Between)	0.5388	0.5388
R-Squared (Overall)	0.3953	0.3953

Source: Author Estimation Using Phyton Programming

Furthermore, the results from the Breusch-Pagan test are as follows: LM Statistic: 2.7748; LM-Test p-value: 0.8365; F-Statistic: 0.3490; F-Test p-value: 0.8981.

It can be assumed that the results from a within (fixed-effects) regression model where GDP growth is modelled as a function of the different types of digital payments, with fixed effects for each country and year. This model accounts for any time-invariant unobserved characteristics of each country and any common shocks across countries in each year. There are some notes on these results:
- The R-squared is 0.886, which suggests that a significant proportion of the variation in GDP growth is accounted for by the model. However, keep in mind that R-squared tends to be high in panel data models with fixed effects because it also captures the variation between entities (countries in this case).
- The coefficient estimates for the digital payment variables show the estimated change in GDP growth for a one-unit change in these variables, holding all else constant. However, most of them are not statistically significant at the usual levels ($p < 0.05$), which suggests that these variables may not have a significant effect on GDP growth in this sample.
- The intercept and the dummy variables for the countries represent the average GDP growth for the reference country (IDN) and the average differences in GDP growth for the other countries, respectively, holding all else constant. The dummy variables for the years represent the average differences in GDP growth for these years compared to the reference year (2019), holding all else constant.
- The standard errors assume that the errors are homoscedastic and not autocorrelated, which may not be the case in this data.

Let us now check for some of the classical assumptions by plotting the residuals to visually inspect for any violation of homoscedasticity (constant variance of errors) and normality of errors. Then, we use statistical tests for these assumptions. We also check for multicollinearity using the variance inflation factor (VIF). Unfortunately, there is no straightforward way to check for endogeneity in this context.

These are the results of our checks for classical assumptions:

1. Linearity. We assumed linearity in our regression model. Violations of this assumption would typically be noticed if there were non-linear relationships in the scatter plots of the residuals.

2. Independence. As previously mentioned, this assumption is often violated in panel data, since observations of the same entities (countries in this case) over time may be dependent. The fixed-effects model used here accounts for this to some extent by controlling for the time-invariant characteristics of each country.

3. Homoscedasticity. The residuals scatter plot does not show a clear funnel shape, which suggests that the variance of the errors may be approximately constant. However, Bartlett's test for homoscedasticity has a p-value less than 0.05, indicating evidence against the null hypothesis of equal variances (i.e., evidence of heteroscedasticity). More advanced methods (e.g., robust standard errors and generalized least squares) may be needed to address this.

4. No multicollinearity. The variance inflation factors (VIFs) for the predictors are quite high, especially for `MRDG`, `MDP`, and `RDP`. This indicates a high degree of multicollinearity, which means that these variables are highly correlated with each other. This does not invalidate the model, but it can make the estimates of the individual coefficients less precise.

5. No endogeneity. This assumption is hard to test directly. If there is reason to believe that one or more of the predictors are endogenous (i.e., correlated with the error term), instrumental variable methods may be needed.

6. Normality of errors. The residuals appear to roughly follow a normal distribution in the QQ plot, and the Shapiro-Wilk test for normality does not reject the null hypothesis of normality ($p > 0.05$). This suggests that the assumption of normally distributed errors may hold in this case.

The R-squared value is 0.395, which means that approximately 39.5% of the variation in the dependent variable (LGDPG) can be explained by the independent variables (LMRDG, LMDP, LRDP, LUMPIBUY, LUMPIBILL, LUMPIMON). However, the p-values for most of the coefficients are quite high, indicating that they are not statistically significant at the 0.05 level.

Table 5 OLS Regression Results

Dep. Variable	: LGDPG	R-squared	: 0.395
Model	: OLS	Adj. R-squared	: 0.116
Method : Least Squares		F-statistic	: 1.416
Date	: Sat, 22 Jul 2023	Prob (F-statistic)	: 0.281
Time	: 16:08:58	Log-Likelihood :	-55.306
No. Observations	: 20	AIC	: 124.6
Df Residuals	: 13	BIC	: 31.6
Df Model	: 6		
Covariance Type	: nonrobust		

	coef	std err	t	P>|t|
Intercept	4.6979	3.227	1.456	0.169
LMRDG	2.438e-07	2.27e-07	1.072	0.303
LMDP	2.198e-07	2.3e-07	0.958	0.356
LRDP	4.09e-08	1.67e-07	2.245**	0.040
LUMPIBUY	1.175e-07	9.55e-08	1.230	0.241
LUMPIBILL	1.588e-07	9.44e-08	1.681	0.117
LUMPIMON	5.506e-08	8.23e-08	0.669	0.515

Omnibus:	6.507	Durbin-Watson :	2.446
Prob(Omnibus):	0.039	Jarque-Bera (JB) :	4.135
Skew:	-1.039	Prob(JB) :	0.126
Kurtosis:	3.801	Cond. No. :	4.16e+08

Note: *p-value < 0.10. **p-value < 0.05, *** p-value < 0.01, The value is the standardized coefficient. Standard Errors assume that the covariance matrix of the errors is correctly specified.
Source: Authors' estimation using "Phyton".

Discussion

The results obtained in Table 5 of the panel data regression analysis imply that the overall model test is insignificant using a significance level of 5 per cent. In addition, the coefficient of determination obtained from R^2 is only 39.5%, which means that digital payment systems are carried out through various means such as the use of digital payment gateways for simultaneous and partial financial transactions that only accept (LRDP) and only made digital payments (LMDP), and financial transaction activities via the internet for online shopping (LUMPIBUY), Bill payments (LUMPIBILL) and remittances (LUMPIMON) still unable to explain the economic growth variable (LGDPG) and the remaining 60.5% is influenced by other factors. In general, this shows that the use of digital payment systems in ASEAN countries has not been optimal in encouraging regional economic growth.

Through simultaneous measurement of influence through the F test, it can be seen that although it has a positive influence, almost all predictors have an insignificant influence on gross domestic product growth simultaneously. Viewed from Table 5, only variable LRDP or receiving payment transfer has a significant effect. This is in line with research stating that currently, digital payments in ASEAN countries are still not fully able to encourage business actors and customers to be involved in financial transactions to develop further or to adapt the electronic payment technology (Avirutha, 2021). As investigated by Alzoubi et al.(2022), It is high likely that digital transactions such as online shopping still do not have a real impact on financial transactions as a whole due to security issues in electronic transactions and also the need and culture of using cash in society (Kitamura, 2022).

However, there is potential for the evolvement of electronic payments in the future to the economy through the added value provided(Avirutha, 2021). This is also supported by the results of the change graph in Figure 2 which visualizes a significant transition simultaneously from the 2020/2021 period in digital payments, during and post-COVID-19 pandemic. In this work, we consider the general case studies by (Kinda, 2019; Pangestu & Lee-Makiyama, 2019), which revealed that with the

development of e-commerce, electronic payments will further develop and encourage more significant economic growth. Nonetheless, the growth of electronic payments still requires the role of government to implement flexible regulations to support the socialization of the expansion of digital-based financial services provision (Van Bon, 2021; Widjojo, 2020).

CONCLUSION

Developing countries that enjoy economic growth in the ASEAN region, such as Indonesia, Malaysia, the Philippines, Thailand and Vietnam, are currently developing payment systems. Where the seamless electronic payment system will support agility, efficiency and effectiveness in financial transactions. However, some of the broad conclusions drawn from the results of the study found that digital payment is yet able to fully boost regional economic growth. This is most likely due to the electronic transaction security system and the still-not-created cashless society supporting this electronic transaction significantly. Therefore, the role of regulators and the business community is needed to further expand services and develop reliability and innovation in the payment system, making it easier for people to transact business electronically. The growing digital payment-based business is expected to encourage an increase in gross domestic state products.

Despite the fact that the study could give more insight into measurements of how digital payments contribute to economic growth and the volume or value of digital financial transactions in various ways, there are some limitations to this study that only covers a period of four years due to the ubiquitousness of online payment applications starting in 2019 to 2024. In addition, it is obvious that these limitations reflect inadequacy of the data available that focuses only on a few countries. Besides, not all other variables in regard to digital payment have been included in this study. Then, it might be better to focus on variables related to the use and adoption of digital payments. If it is more interested in the overall role of digital payments, it might also consider factors like the regulatory environment, infrastructure, etc. Therefore, the study suggests that future research should include a longer time and more countries for a more comprehensive result.

ACKNOWLEDGMENT

The work was supported by the Research Program of LPPM Universitas Terbuka in 2022.

REFERENCES

Ahmad, M., Majeed, A., Khan, M. A., Sohaib, M., & Shehzad, K. (2021). Digital financial inclusion and economic growth: provincial data analysis of China. *China Economic Journal*, *14*(3), 291–310. https://doi.org/10.1080/17538963.2021.1882064

Al-Own, B., Saidat, Z., Kasem, J., & Qasaimeh, G. (2023). Impact of Digital Payment Systems and Blockchain on Economic Growth. *2023 International Conference on Business Analytics for Technology and Security (ICBATS)*, 1–5. https://doi.org/10.1109/ICBATS57792.2023.10111140

Alzoubi, H., Alshurideh, M., Kurdi, B., & ... (2022). The effect of e-payment and online shopping on sales growth: Evidence from banking industry. *... Journal of Data and ...*.

Aniqoh, N. A. F. A. (2020). The Role of Digital Economy to Enhancing Sustainable Economic Development. *International Journal of Social Science and Business*, *4*(4), 519. https://doi.org/10.23887/ijssb.v4i4.28881

Avirutha, A. A. (2021). ASEAN in digital economy: Opportunities and challenges. *Journal of ASEAN PLUS Studies*.

Box, S., & Gonzalez, J. L. (2017). The Future of Technology: Opportunities for ASEAN in The Digital Economy. *Global Megatrends: Implications for the ASEAN Economic Community*, *March*, 37–60.

Chaimankong, B., Chaimankong, M., Jermsittiparsert, K., & Chetthamrongchai, P. (2021). the Impact of Covid-19 on Thai Consumer Behaviour in Using Digital Banking. *Academy of Strategic*

Management Journal, *20*(Special Issue 3), 1–9.
Chea, S. (2021). *Impact of Financial Inclusion and Liberalization on ASEAN Economic Development*. digital.library.adelaide.edu.au.
Chen, L., & Kimura, F. (2019). *Developing the digital economy in ASEAN*. books.google.com.
Chen, L., & Ruddy, L. (2020). Improving Digital Connectivity : Policy Priority for ASEAN Digital Transformation. *Economic Research Institute for ASEAN and East Asia Key*, *07*(2020), 1–4.
Cheung, P., & Taojun, X. (2023). *The ASEAN Digital Economy: Towards an Integrated Regional Framework*. books.google.com.
Chia, S. Y. (2017). Modalities for Asean economic integration: Retrospect and going forward. *The Singapore Economic Review*. https://doi.org/10.1142/S0217590818400015
Doheir, M., Talib, M. S., Harum, N., Abu, N. A., & ... (2019). Impact of cashless society on the economic growth in Malaysia. In *… . Revista de Ciencias …*. redalyc.org.
Doheir, M., Talib, M. S., Harum, N., Abu, N. A., Al-Mhiqani, M. N., & Ali, M. F. (2019). Impact of cashless society on the economic growth in Malaysia. *RELIGACIÓN. Revista de Ciencias Sociales y Humanidades*, *4*(16), 300–307.
General, A. C. (2023). 2 Evaluating the Impact of Digital Economy Collaborations in ASEAN. *... ASEAN Digital Economy: Towards an Integrated …*.
Gulati, V. P., & Srivastava, S. (2007). The Empowered Internet payment gateway. *Computer Society of India*, 98–107.
Ha, H., & Chuah, C. K. P. (2023). Digital economy in Southeast Asia: challenges, opportunities and future development. *Southeast Asia: A Multidisciplinary Journal*, *23*(1), 19–35. https://doi.org/10.1108/SEAMJ-02-2023-0023
Hastuti, I. S., & Jauhari, A. K. (2021). Middle economic growth towards to development of e-commerce in Southeast Asia. *Journal of Economic Empowerment …*.
Ikhwan, A. D., & Rahadi, R. A. (2022). Valuation of digital start-up business: A case study from digital payment solution services company. *Eqien-Jurnal Ekonomi Dan Bisnis*.
Kasemharuethaisuk, H., & Samanchuen, T. (2023). Factors Influencing Behavior Intention in Digital Investment Services of Mutual Fund Distributors Adoption in Thailand. *Sustainability (Switzerland)*, *15*(3). https://doi.org/10.3390/su15032279
Kinda, M. T. (2019). *E-commerce as a Potential New Engine for Growth in Asia*. books.google.com.
Kitamura, Y. (2022). *A Cashless Society: Facts and Issues BT - Quest for Good Money: Past, Present and Future* (Y. Kitamura (ed.); pp. 125–139). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-5591-4_7
Menon, N. (2016). ASEAN'S Digital Economy. *Asean's Digital Economy*, *3*(2), 28–33.
Nguyen, M. H., Gruber, J., Fuchs, J., Marler, W., Hunsaker, A., & Hargittai, E. (2020). Changes in Digital Communication During the COVID-19 Global Pandemic: Implications for Digital Inequality and Future Research. *Social Media and Society*, *6*(3). https://doi.org/10.1177/2056305120948255
Ong, H.-B., Wasiuzzaman, S., Chong, L.-L., & Choon, S.-W. (2023). Digitalisation and financial inclusion of lower middle-income ASEAN. *Heliyon*, *9*(2), e13347. https://doi.org/10.1016/j.heliyon.2023.e13347
Pangestu, M., & Lee-Makiyama, H. (2019). *ASEAN 2040: Data Flows and Electronic Payments*. eria.org.
Tailor, N. (2020). Competition in the new ASEAN economy. *Journal of Southeast Asian Economies*.
Tang, J., Liu, F., Lu, S., Qin, S., & Shao, S. (2020). Research on the new generation electronic payment system applied in "the belt and road." *Proceedings - 2020 International Conference on E-Commerce and Internet Technology, ECIT 2020*, 5–9. https://doi.org/10.1109/ECIT50008.2020.00009
Tran, L. Q. T., Phan, D. T., & Nguyen, M. T. (2022). Digital Economy: A Comparative Study in ASEAN. *Theory, Methodology, Practice*, *18*(2), 83–92. https://doi.org/10.18096/TMP.2022.02.05
Trujillo, V., Sitorus, D., & Aviles, A. M. (2018). *Advancing Digital Financial Inclusion in ASEAN*.
Van Bon. (2021). The Digitalization – Economic Growth Relationship in Developing Countries and the Role of Governance. *Scientific Annals of Economics and Business*, *68*(4), 481–493.

https://doi.org/10.47743/saeb-2021-0028
Widjojo, R. (2020). The development of digital payment systems in Indonesia: a review of go-pay and ovo e-wallets. In *Economic Alternatives*. unwe.bg.
Wonglimpiyarat, J. (2014a). Competition and challenges of mobile banking: A systematic review of major bank models in the Thai banking industry. *The Journal of High Technology Management …*.
Wonglimpiyarat, J. (2014b). Mobile banking strategy: E-payment market and AEC opportunities. *Journal of Payments Strategy &Systems*.
Yaqin, M., & Safuan, S. (2023). Digital Financial Inclusion and Implications for Developing Countries Economic Growth. *Journal of Developing Economies*, *8*(1), 29–48. https://doi.org/10.20473/jde.v8i1.38361
Ying, W. C., & Mohamed, M. (2020). Understanding the factors influences users continuous intention towards e-wallet in Malaysia: Identifying the gap. *Research in Management of …*.
Yu, Y. B., & Chung, T. (2022). Electronic Payment Performance: A Trend and Contextual Analysis of Its Social Impact on Secured E-Payment in 2016-19. *… of Research on Social Impacts of E-Payment and …*.

