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THE IMPACT OF DIGITAL FINANCIAL INCLUSION ON ECONOMIC GROWTH IN ASEAN COUNTRIES: POLICY IMPLICATIONS FOR VIETNAM

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ABSTRACT

Applying the Bayesian approach, this paper examines how digital financial inclusion affects economic growth in ASEAN nations between 2015 and 2022. The findings demonstrate that digital financial inclusion has a detrimental effect on economic growth. This is a significantly different conclusion from earlier research. This can be explained by the fact that digital financial services are still expensive and require a while to mature or adapt to current development paradigms. On the part of control factors, while unemployment (UNE) negatively affects economic growth, others including population growth (POP), inflation (INF), and foreign direct investment (FDI) have a positive effect. The authors used the research results on the data range of ASEAN countries as prior information to regress the model with the data range of Vietnam. The research model's findings in Vietnam are quite similar to those of the research model in ASEAN countries in general except for the POP variable, which assumes that economic growth (GDP) will decrease when POP increases. Consequently, to stimulate economic growth, ASEAN nations, particularly Vietnam, must identify strategies to lower the cost of accessing digital finance, decrease the unemployment rate, attract more foreign direct investment, and sustain a moderate inflation rate. To reduce the cost of accessing digital finance, policymakers should encourage financial institutions to provide services at lower costs and in remote areas. Additionally, FinTech providers can be leveraged to provide digital financial services.

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1. Introduction

The United Nations determined that inclusive finance is an important solution to achieve 7/17 sustainable development goals by 2030. The G20 group determined that inclusive finance is one of the main pillars in line with its development. The financial sector contributes significantly to the distribution of limited resources in an economy by offering reasonably priced financial services, thereby fostering economic growth (Chen & Yuan, 2021). This approach shows that financial inclusion by providing access to credit, savings, and insurance can enable poor people, and small businesses to invest in productive activities at reasonable cost. This can lead to job creation, and increased income levels contributing to economic growth (Demirgüç-Kunt et al., 2015). Thereby, we can see the positive impact of comprehensive finance on economic growth.

Previous studies of financial inclusion have used traditional financial inclusion proxy measures based on financial development and aggregate financial market and financial intermediation indicators. In 2016, the G20 Summit officially proposed advanced principles of digital financial inclusion to promote the digital financial era and upgrade financial inclusion in all countries. Besides, the COVID-19 pandemic has contributed to accelerating the digital transformation of pandemic financial services. During the COVID-19 pandemic, countries have imposed blockades and curfews as a preventative measure to prevent the virus's outbreak. Government agencies and health experts promote the use of cashless, contactless payments and other digital financial services to minimize the risk of virus transmission through currency processing, thereby bringing new possibilities for potential comprehensive digital financial adoption. Mobile money services, online banking, and other financial technology advances can facilitate the livelihoods of small businesses and low-income families.

In essence, digital financial inclusion is the most recent stage of digital financial inclusion. Consequently, the theory of the impact of digital financial inclusion on economic growth is also based on the foundation of the theory of the impact of financial inclusion on economic growth, but with an additional digital element in the measure of financial inclusion.

Since its establishment in 1967, the Association of Southeast Asian Nations (ASEAN) has achieved remarkable economic achievements. By 2030, ASEAN is expected to rise to become the fourth-largest economic bloc in the world due to its tremendous potential for growth. The region faces new opportunities and difficulties because of the quickly shifting global economic landscape, with digital technology and sustainable development emerging as key factors in ASEAN's future prosperity. As one of the three pillars of the ASEAN 2025 vision, financial inclusion was also recognized by ASEAN nations, who formed the Working Committee on Financial Inclusion in 2016, to work together to advance financial inclusion throughout ASEAN nations. In the ASEAN countries region, with a young population (more than half of the 648 million people are under 30 years old), a thriving middle class, and agility in digital adoption are ready for the goal of digitizing the economy. In 2018, ASEAN countries transitioned to a digital economy with important steps such as promoting the development of e-commerce and encouraging the development of financial technology (Fintech). However, until now there has been no research evaluating the impact of digital financial inclusion on the economic growth of ASEAN countries. That is why the authors chose to carry out the topic "**The impact of digital financial inclusion on economic growth in ASEAN countries - Policy implications for Vietnam**".

2. Theoretical framework and literature review

2.1. Theoretical framework

The World Bank defines "*financial inclusion as the access of individuals and the business sector to useful and affordable financial products*". "Financial inclusion" was replaced by "digital financial inclusion" at the 2nd GPFI Conference held on October 30-31, 2014 in Basel, Switzerland. This term is an updated version of financial inclusion in the digital age, "*a digital approach to expanding the coverage and access to financial services for all segments of society by applying relevant digital technologies in the financial sector*" (World Bank, 2022).

Digital financial inclusion has many advantages. It can help banks reduce costs by reducing queues in banking halls, reducing paperwork and manual documentation, and maintaining fewer bank branches (Manyika et al., 2016). For financial and monetary authorities, digital finance can also reduce the amount of physical cash in circulation and be a tool to reduce high inflation in developing and poor countries (GPFI, 2016). However, achieving financial inclusion through digital solutions requires internet connectivity. In most cases, broadband internet is not cheap. Since the advent of DFI, internet broadband costs have remained high in many poor and developing countries (Friedline et al., 2020; Niu et al., 2022). The implication is that DFIs may increase the cost of internet broadband, rather than reduce it. High internet broadband costs are bad for financial inclusion because the poor cannot afford it and use internet-enabled digital devices to access affordable financial services. Additionally, digital financial inclusion may make digital fraud easier because fraudsters can exploit poor data protection measures and those weaknesses can be exploited to steal users' personal information or money. This could erode public trust in digital financial products and undermine confidence in government or private sector digital identity initiatives (Müller & Kerényi, 2019; Oehler & Wendt, 2018). These characteristics of digital financial inclusion are likely to contribute to inconsistencies in research findings on its impact on economic growth.

2.2. Literature review

Studies in developing countries have shown that financial inclusion/digital financial inclusion positively impacts economic growth. Inoue & Hamori (2016) analyzed the relationship between financial access and economic growth in 37 sub-Saharan African nations between 2004 and 2012. According to the study which uses a dynamic panel GMM estimator, real GDP per capita and the number of commercial bank branches are positively correlated. Additionally, financial deepening significantly and favorably influences sub-Saharan Africa's economic growth. Thomas (2017) examined the relationship between access to finance and economic growth in eight South Asian countries from 2007 to 2015. Using the GMM estimator, the results showed that, increasing finance access leads to increased income. Furthermore, increases in financial inclusion indicators have a greater impact on economic growth in low-income countries than in middle-income countries. Kim et al. (2018) used dynamic panel estimation, the vector autoregression method (VAR), impulse response functions (IRF), and panel Granger causality testing to examine the relationship between financial inclusion and economic growth in 55 Organization of Islamic Cooperation (OIC) countries. Economic growth is positively impacted by financial inclusion, as evidenced by the dynamic panel estimation results. Makina and Walle (2019) used the GMM dynamic panel data estimator system to to evaluate the effect of financial inclusion on economic growth in 42 African nations from 2004 to 2014. The number of commercial bank branches per 100,000 adults

is used to measure financial inclusion, and the results demonstrate that financial inclusion has a positive and statistically significant impact on economic growth in Africa. Suidarma (2019) analyzes the impact and long-term relationship of financial inclusion through the tool of the number of Automated Teller Machines (ATMs) and commercial bank branches on ASEAN economic growth through Gross domestic product (GDP). The data used is secondary data in the form of an annual survey of ASEAN countries from 2008 to 2015 to see this impact after the global crisis. The method used the Panel Vector Error Correction Model (VECM) to view the long-run relationship and response of GDP when shocks occur across a variable financial horizon. The study's estimated results show that financial inclusion through the number of ATMs and commercial bank branches can positively contribute to economic growth in ASEAN.

In developed or developing areas, there are similar results. Sethi and Acharya (2018) employed panel data models, including fixed effects, random effects, panel cointegration, and panel causality tests, to investigate the relationship between financial inclusion and economic growth for 31 developed and developing nations between 2004 and 2010. The findings indicate a two-way causal relationship between financial inclusion and economic growth, with a positive and long-term association observed in the chosen nations. The analysis indicates that suitable policies to foster financial inclusion would eventually result in higher economic growth. Besides, it confirms the relationship between financial inclusion and growth. Huang et al. (2021) compared old and new EU (27) nations from 1995 to 2015 to study the relationship between financial inclusion and economic development. The study discovered that financial inclusion is crucial for economic growth using FMOLS and the panel autoregressive distributed lag (ARDL) model. In the developing Indian economy, Dahiya and Kumar (2020) studied the connection between financial inclusion and economic growth between 2005 and 2017. The study indicated that only using financial inclusion is linked to economic growth after estimating the association using Bayesian autoregression.

However, regression studies on the relationship between financial inclusion and economic development show different results. Between 2014 and 2017, Nizam et al. (2020) examined how financial inclusion affected economic growth in 63 developed and developing nations. The study used cross-sectional threshold regression techniques as well as a fresh formulation of the financial inclusion indicator. The study concludes that financial inclusion and economic growth have a non-monotonic positive relationship, which becomes more pronounced at higher financial inclusion index levels. Karim et al. (2022) use data from 60 nations between 2010 and 2017 to investigate how financial inclusion affects economic growth. A new index of financial inclusion (IFI) was created for every nation to assess the degree of financial inclusion over time. The primary conclusions drawn from the dynamic panel threshold estimation technique show that the connection between financial inclusion and growth has a threshold effect. The findings indicate that financial inclusion positively impacts economic growth at a lower level and is beneficial. Moreover, developing and emerging market nations benefit more from the financial inclusion positive threshold effect on growth than developed nations.

In addition to the individual impact of financial inclusion/digital financial inclusion on economic growth, several studies have examined the role of other variables that impact the relationship between financial inclusion/ digital financial inclusion and economic growth.

Shen et al. (2021) examine the relationship between digital finance and the role of financial literacy and economic growth using spatial data and techniques for 86 neighboring countries. The authors' findings show that digital finance significantly positively impacts economic growth and has spatial spillover effects on neighboring countries. Ahmad et al. (2021) investigate the impact of financial inclusion and human capital on the economic growth of Chinese provinces between 2011 and 2018. Empirical results show that digital finance and Human capital significantly positively influence China's provincial economic growth. Rekha et al. (2021) examine the relationships between financial inclusion, information and communication technology, and economic growth in 22 emerging countries from 2004 - 2017. Results of panel data analysis performed on the data set related to emerging economies show the relationship between information and communication technology diffusion - economic freedom - Financial development has a positive impact on financial inclusion in the long run, emphasizing the importance of creating an economic environment that is favorable for sustainable economic growth. Chinoda & Kapingura (2023) examine the role of institutions and governance in the link between digital finance and economic growth in Sub-Saharan Africa (SSA) from 2014 to 2020. Regression results through the GMM method show a significant positive impact of institutional quality and governance on the economic growth relationship with financial inclusion in SSA.

2.3. Research gaps

Firstly, despite numerous studies examining the effect of financial inclusion on economic growth, the findings are inconsistent. Furthermore, with the advancement of the technological era, traditional financial services have evolved into digital financial services. While these digital financial services may offer enhanced convenience regarding space and time for customers, they can also present obstacles due to associated access prices or risks. Consequently, additional study is required to assess the influence of digital financial inclusion on economic growth.

Secondly, prior research has employed several methodologies like OLS, FEM, REM, GMM, VAR, VECM, etc. These methods share a commonality in their frequency statistical approach, treating the parameter as an unknown yet deterministic value, with the ultimate objective of determining the likelihood of data occurrence. This research examines Bayesian statistics, treating the parameter as a random variable to determine the probability of the hypothesis's occurrence. The Bayesian methodology offers the advantage of applicability to any number of data, whereas the frequentist method typically necessitates a substantial quantity of observations. Implementing this topic is crucial, as its objective is to examine the comprehensive effect of digital financial inclusion on economic growth in ASEAN countries. The findings from the overall population will serve as a priori data for calculating the posterior distribution in the context of Vietnam. Nevertheless, owing to constraints in data availability, the author exclusively gathered data from 2015 to 2022, resulting in only eight observations, rendering the frequency method impractical.

3. Research model and methods

3.1. Research model

Based on the research of Ahmad et al. (2021), Rekha et al. (2021), and Tran Thi Kim Oanh (2024), the author establishes the following research model:

$$GDP_{i,t} = \beta_0 + \beta_1 DFI_{i,t} + \beta_x X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where:

$DFI_{i,t}$ is an independent variable represented by seven components below:

+ MMT: Number of mobile and internet banking transactions (during the reference year) per 1,000 adults,
+ ODCB: Outstanding deposits with commercial banks (% of GDP),
+ OLCB: Outstanding loans from commercial banks (% of GDP),
+ CC: Number of credit cards per 1,000 adults,
+ DC: Number of debit cards per 1,000 adults,
+ NET: Individuals using the Internet (% of population),
+ MOBI: Mobile subscription per 100 people.

The indicators listed above were chosen in accordance with the G20 Policy Recommendations for Advancing Financial Inclusion and Productivity Gains through Digital Public Infrastructure (GPFI, 2016) and after consulting Tran Thi Kim Oanh (2024)'s research. We are unable to utilise all of the indicators of the G20 Digital Financial Inclusion Indicator System at this time due to the incomplete availability of cross-country data for other indicators.

$X_{i,t}$ is the vector of control variables.

$i = 1, 2, \ldots N$; $t = 1, 2, \ldots T$ where i is the country and t is the time

Table 1. Table describing variables in the research model (1)

Variable name	Symbol	Measure	Source	Expected	Inheritance research
Dependent variable					
Economic growth	GDP	GDP per capita growth (annual %)	WDI		
Independent variables					
Digital financial inclusion	DFI	PCA of 7 indicators	FAS, GDFI	+	Ahmad et al. (2021), Rekha et al. (2021), Tran Thi Kim Oanh (2024)
Control variables					
Unemployment	UNE	Unemployment, total (% of total labor force) (modeled ILO estimate)	WDI	-	Shen et al. (2021), Kim et al. (2018), Karim et al. (2022)
Population growth rate	POP	Population growth (annual %)	WDI	-	Ahmad et al. (2021), Shen et al. (2021), Nizam et al. (2020), Kim et al. (2018), Karim et al. (2022)
Inflationary	INF	Inflation, GDP deflator (annual %)	WDI	-	Ahmad et al. (2021), Nizam et al. (2020), Kim et al. (2018), Karim et al. (2022)
Foreign Direct Investment	FDI	Foreign direct investment, net inflows (% of GDP)	WDI	+	Yaqin & Safuan (2023), Ozturk & Ullah (2022)

3.2. Research methods

The Principal Components Analysis

The current study uses the Principal Components Analysis technique (PCA) to calculate DFI. PCA is a method that minimizes dataset dimensionality while preserving the majority of its critical attributes. The PCA objective is to identify the directions in the original data that account for the most variation. The principle components are the data projections onto these axes, and these directions are referred to as principal axes.

The research model is as follows:

$$DFI_j = W_{j1}X_1 + W_{j2}X_2 + ... + W_{jn}X_n$$

Where, W_{j1}, W_{j2}, …, W_{jn} are the weights assigned to each component, and X_1, X_2,…, X_n are the measured variables, representing the n components listed above. This procedure converts the data into a consistent range, typically within the interval of [0; 1]. Data normalization allows the presentation of standardized information across different criteria.

Bayes

Bayesian analysis commences with a posterior model establishment, which integrates the gathered research data and prior information to delineate the probability distribution of the parameters. The posterior distribution comprises two elements: the likelihood function, which reflects the model parameters derived from the observed data, and the prior distribution, which encapsulates the existing information regarding the model parameters.

Posterior distribution α Likelihood function x Prior information

Since y and θ are both random variables, we can apply Bayes' theorem to calculate the posterior distribution of θ for a given variable y

$$p(y) = \frac{p(y|\theta)p(\theta)}{p(y)} = \frac{f(y;\theta)\pi(\theta)}{n(y)}$$

Where, $n(y)$ is the posterior predictive probability distribution, $f(y;\theta)$ is the likelihood function of y under given θ, $\pi(\theta)$ is the prior distribution of θ.

The authors performed a study on the effects of digital financial inclusion on economic growth from 2015 to 2022 across 10 ASEAN nations, comprising 80 observations. The prior information gathered from the research findings of the model in ASEAN countries will be utilized to estimate the research model in Vietnam, comprising 8 observations. The aforementioned small sample problem is appropriate for the Bayesian method, as it does not rely on asymptotic theory and does not necessitate approximation limitations to elucidate the posterior distributions; thus, by incorporating prior information, Bayesian analysis can be performed effectively with limited sample sizes. This is unachievable using conventional frequency approaches such as OLS, FEM, REM, and GMM.

3.3. Data

Research data was collected from official sources by the authors: The World Development Indicator (WDI) of the World Bank (WB), the Financial Access Survey (FAS) of the International Monetary Fund (IMF), and the Global Partnership for Financial Inclusion (GPFI). The research period is from 2015-2022 because, before 2015, the digital financial era had not yet developed strongly. It was not until 2016 that the term digital financial inclusion was used in documents of the Association's comprehensive financial recommendations. From here, data on digital financial inclusion measurement parameters have just begun to be built in countries, including ASEAN countries.

4. Research results and discussion

4.1. The Principal Components Analysis result

Table 2. PCA result

DFI	MMT	ODCB	OLCB	CC	DC	NET	MOBI
W	0.9338	0.2432	0.2612	0.0024	0.0029	0.0265	0.0008

According to the results, DFI is calculated as follows:

$$DFI_{i,t} = 0.9338^{*}MMT_{i,t} + 0.2432^{*}ODCB_{i,t} + 0.2612^{*}OLCB_{i,t} + 0.0024^{*}CC_{i,t} + 0.0029^{*}DC_{i,t} + 0.0265^{*}NET_{i,t} + 0.0008^{*}MOBI_{i,t}$$

4.2. Bayesian model regression results

Research results and discussion in the ASEAN region

Table 3. Bayesian model regression results

	Mean	Std. dev.	MCSE	Median	Equal-tailed [95% cred. interval]	
DFI	-0.00680	0.00636	0.00004	-0.00685	-0.01922	0.00576
UNE	-0.24161	0.20411	0.00118	-0.24336	-0.63387	0.16658
POP	0.13125	0.49153	0.00286	0.13189	-0.83249	1.10606
INF	0.00329	0.08614	0.00050	0.00314	-0.16491	0.17401
FDI	0.19623	0.07855	0.00045	0.19639	0.04229	0.35066
_cons	1.848855	0.77909	0.00477	1859023	0.28662	3.34459
var	18.05362	3.098822	0.01988	1772376	12.95095	25.04549
Avg efficiency	0.9409					
Max Gelman–Rubin Rc	1					

Bayesian analysis is simulated through Markov chain Monte Carlo (MCMC), so to ensure the robustness of Bayesian regression, the MCMC chain must converge, meaning the MCMC chain must ensure stationarity. In Table 3, we see that Max Gelman–Rubin Rc = 1 < 1.1, so we can conclude that the MCMC series meets the convergence requirement. In addition to diagnosis convergence using Rc, Balov (2020) also proposed to test convergence through average minimum efficiency. Also from Table 3, it can be seen that the smallest efficiency (Avg efficiency: min) is 0.9409, far exceeding the allowable level of 0.01, so the above model meets the requirements.

The "Equal-tailed [95% cred. interval]" represents the confidence interval in Bayesian regression, indicating a 95% probability that the parameter falls inside this range. The Bayesian methodology employs the Metropolis-Hastings algorithm, simulating the regression model 10,000 times, yielding a regression coefficient per iteration; consequently, the regression results table will present the "Mean" and "Median" values. Standard errors (Std. Dev) and Monte Carlo standard errors (MCSE) are also present. A closer MCSE to 0 indicates greater stability of the MCMC chain (Flegal et al., 2008).

In the column "Mean" of Table 3 the variables POP, INF, and FDI will positively impact GDP, while the variables DFI and UNE negatively impact GDP. In addition to calculating the average value of each independent variable on economic growth, the Bayesian method allows us to determine the probability of events occurring by testing the posterior interval.

Table 4. Posterior probability of Bayesian regression results

	Mean	Std. dev.	MCSE
prob1 : {GDP:DFI} < 0	0.85923	0.34779	0.00203
prob1 : {GDP:UNE} < 0	0.88170	0.32297	0.00190
prob1 : {GDP:POP} > 0	0.60297	0.48928	0.00284
prob1 : {GDP:INF} > 0	0.51490	0.49978	0.00289
prob1 : {GDP:FDI} > 0	0.99390	0.07787	0.00045

The results of the Bayesian posterior interval test in Column "Mean" of Table 4 show that the average probability of events occurring is greater than 50%, so the direction of the impact of the independent variables on economic growth as shown in Table 3 has a probability larger than the opposite direction.

The regression coefficient of digital financial inclusion (DFI) has a negative sign with a probability of 85.92%, meaning DFI reduces economic growth. This is likely because digital finance adoption by people in developing countries at a very early stage is costly and takes some time to significantly impact the overall economy (Banna, 2020; Ozili, 2018) accelerating digital finance is considered as one of the significant means for the banking sector stability that subsequently leads to economic growth. However, both the negative and positive effects of financial inclusion bring the question whether digital finance is good for sustainable growth or not. Hence, this paper aims to examine the role of digital financial inclusion on promoting sustainable economic growth through banking stability in Bangladesh using the data of 2011-2018 from Orbis bank-focus and financial access survey (FAS. The study result is consistent with the conclusions of Karim et al. (2022).

The coefficient of unemployment (UNE) also has a negative sign with a probability of 88.17%, meaning that a higher unemployment rate will reduce economic growth. This is proven in the results of other studies, such as Kim et al. (2018), and Karim et al. (2022).

In this study, the population growth rate (POP) is considered a factor that can promote economic growth with a probability of 60.297%. One of the advantages of the Southeast Asia region is its abundant and cheap labor force, which attracts a huge amount of investment every year to countries in the region. Therefore, population growth in ASEAN countries is generally beneficial for the economy. This result is consistent with the conclusions of previous studies by Ahmad et al. (2021).

Inflation (INF) is also considered a factor that can stimulate economic growth with a probability of 51.49%. High inflation can negatively impact economic growth by reducing consumer purchasing power, reducing consumption ability, affecting investment and business profits, causing a trade balance deficit, etc. However, moderate and reasonable inflation can stimulate economic growth because investment will be more attractive than holding cash or increasing consumption due to increased price sentiment, etc. Studies by Kim et al. (2018), and Ahmad et al. (2021) also have similar conclusions.

Foreign direct investment (FDI) is always considered a source of external capital that contributes to economic growth in recipient countries. This is further confirmed in this study with a very high positive impact probability of 99.39%. Research by Ozturk & Ullah (2022) also reached similar conclusions.

Research results and discussion in Vietnam

To regress the model with the data range of Vietnam, the authors employed the findings of the research on the data range of ASEAN countries as prior information.

Table 5. Bayesian regression results in Vietnam

	Mean	Std. dev.	MCSE	Median	Equal-tailed [95% cred. interval]	
DFI	-0.02439	0.079937	0.003897	-0.02297	-0.19007	0.133712
UNE	-2.49757	1.925975	0.188179	-2.61458	-5.90703	1.575915
POP	-0.27116	3.46971	0.567965	-0.19017	-7.04254	6.314384
INF	0.149707	0.474283	0.011143	0.13053	-0.74985	1.161144
FDI	1.805241	1.170195	0.143437	1.843638	-0.59486	4.020603
_cons	2.70766	3.189043	0.212824	2.662935	-3.69446	8.871541
var	4.011502	4.44486	0.18594	2.767305	0.8234839	14.76637

Table 6. Posterior probability of Bayesian regression results in Vietnam

	Mean	Std. dev.	MCSE
prob1 : {GDP:DFI} < 0	0.6249	0.48417	0.018937
prob1 : {GDP:UNE} < 0	0.8932	0.30887	0.018998
prob1 : {GDP:POP} < 0	0.5206	0.4996	0.067985
prob1 : {GDP:INF} > 0	0.6289	0.48312	0.008278
prob1 : {GDP:FDI} > 0	0.9381	0.24099	0.019635

The column "Mean" of Table 6 displays the Bayesian posterior interval test results, which indicates that the average probability of events occurring exceeds 50%. Consequently, the direction of the independent variables' influence on Vietnam's economic growth, as illustrated in Table 5, has a probability that outweighs its opposite.

Table 7. Compare the results of Vietnam and ASEAN countries

Variables	Mean	
	ASEAN region	Vietnam
DFI	-0.00680	-0.02439
UNE	-0.24161	-2.49757
POP	0.13125	-0.27116
INF	0.00329	0.149707
FDI	0.19623	1.805241

Vietnam's economic and social conditions are not significantly different from those of the other six ASEAN countries in the research sample. Consequently, the research results in Vietnam are consistent with those of the ASEAN countries when four out of five

variables exhibit identical impact trends, except for the population growth rate (Table 7).

In ASEAN countries, an increase in population growth rate will support economic growth but in Vietnam is negative, meaning that an increase in population growth rate will harm economic growth. According to United Nations data, by the end of 2023, Vietnam's population will be nearly 100 million, accounting for 1.25% of the total world population, ranking 3rd in Southeast Asia and 15th in the world. This proves that population growth in Vietnam causes economic pressure, leading to the inhibition of economic growth. This conclusion is consistent with the results of Yaqin and Safuan (2023).

5. Conclusion and policy implications

5.1. Conclusion

This article studies the impact of digital financial inclusion on economic growth in ASEAN countries in the period 2015-2022 using the Bayesian method. The results show that digital financial inclusion hurts economic growth. It is a very different result from previous studies. This is explained by the fact that digital financial services still incur costs and take a long time to reach maturity or to cope with existing development models. Other control variables such as population growth (POP), inflation (INF), and foreign direct investment (FDI) have a positive impact on economic growth while unemployment (UNE) hurts economic growth. From the research results with the ASEAN scope, the authors used a priori information to regress the model with the Vietnam scope. The results of the research model in Vietnam are quite similar to that of the research model in ASEAN countries in general except for the POP variable, which assumes that economic growth (GDP) will decrease when POP increases.

5.2. Policy implications

The empirical findings suggest that digital financial inclusion has yet to prove its role in boosting economic growth in ASEAN countries. However, this does not mean that ASEAN countries should give up on increasing access to digital financial services but rather focus on building technology infrastructure in rural, remote, and isolated areas to ensure that people in these areas have convenient and affordable access to the Internet. Policymakers facilitate digital financial services by leveraging FinTech providers, allowing financial institutions to provide services in remote locations at lower costs. Furthermore, governments should also intensify their initiatives for technology and financial literacy. This would eliminate obstacles that deter people from engaging with digital banking and mitigate the risks of exploitation by fraudsters due to insufficient expertise.

The research results on the impact of digital financial inclusion on economic growth in Vietnam are quite similar to those in ASEAN countries. Consequently, the strategy to reduce unemployment, attract foreign direct investment, lower the cost of accessing digital finance, and operate a reasonable monetary policy does not make a difference. However, Vietnam's population growth rate does not positively impact economic growth. Population growth can be a beneficial economic factor by providing a large labor force that attracts investment; however, it may also cause a negative strain on transportation, healthcare, education, and social welfare infrastructures. As a result, governments must contemplate population policies. Vietnam requires policies that address the "population explosion" predicament to achieve sustainable development.

5.3. Research limitations

The article still has some limitations, and in the future, it is possible to continue research on this issue with improvements.

First, the use of multiple digital financial inclusion measures to calculate the multilateral digital financial inclusion index remains limited due to a lack of data across measures or countries.

Second, this research result is different from most previous research on the relationship between financial inclusion and economic growth. This suggests a direction for further research on whether or not exists the threshold effect in the DFI-GDP relationship in ASEAN.

Third, the authors examined the overall influence of the DFI index on economic growth without investigating the DFI components to ascertain the underlying causes and elucidate them in relation to the practical circumstances in the research countries, including Vietnam.

5.4. Future research

The limitations of the mentioned research can be addressed by incorporating potential indicators that represent digital financial inclusion once the data for these variables is completely disclosed in the future. The study's robustness should be enhanced by examining the component indicators individually in addition to an aggregate index of digital financial inclusion. Furthermore, a study should be conducted to determine whether the relationship between economic growth and digital financial inclusion is linear or nonlinear by examining the threshold effect. Subsequently, ASEAN nations may formulate policies suitable for each phase of economic development and digital financial inclusion.

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