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EXPLORING THE INFLUENCE OF DIGITAL TRANSFORMATION ON FINANCIAL INCLUSION: INSIGHTS FROM SOUTHEAST ASIAN ECONOMIES

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Abstract

Financial inclusion has become a critical driver of economic growth in developing nations, particularly during periods of global economic downturn. In line with economic and technological advancements, many countries have recognised the essential role of financial inclusion in their economic and social development strategies. In Southeast Asia, digital transformation and financial inclusion have gained prominence due to a significant proportion of the population lacking access to formal financial services. This study examines the impact of digital transformation on financial inclusion from 2012 to 2021, utilising data from reputable sources such as the World Bank, IMF, and Bank Indonesia. Employing quantitative methods, including panel data least squares, the study finds that digital transformation significantly influences financial inclusion in Southeast Asian economies. The Digital Transformation Index (DTI) shows a positive and statistically significant effect on financial inclusion. Digital transformation enhances access to financial services, particularly for underserved or remote populations, enabling broader participation in formal financial activities such as banking, payments, and investments. These findings highlight that improving digital infrastructure could play a vital role in advancing financial inclusion across Southeast Asian economies.

Keywords: *digital transformation, financial inclusion, Southeast Asia, financial development, economics*

INTRODUCTION

The increasing focus on economic growth in developing countries has brought financial inclusion to the forefront as a strategic approach to achieving this objective. Amidst a decline in global economic growth, governments in various developing nations have recognised financial inclusion as essential. Numerous countries have adopted financial inclusion policies, many designed as long-term initiatives that remain in effect today. According to Kabakova and Plaksenkov (2018), financial inclusion emerged in the late 20th century, driven by the belief that economic development should encompass all societal layers rather than focusing solely on economic growth. The concept first entered the political agenda in the United Kingdom in 1997 and gained global attention in 2010 through The Global Partnership for Financial Inclusion (GPFI).

As a response to the widespread lack of access to financial services in many countries, financial inclusion has become a significant focus in addressing declining global economic growth. With economic development and digital technology advancements, awareness of financial inclusion as a vital element in economic and social progress has grown (Igwemeka et al., 2020). Financial inclusion, defined as access to financial institutions, products, and services that meet the needs and capabilities of communities, is a key factor in improving individual income and living standards (Omar & Inaba, 2020). It also serves as a catalyst for accelerating economic growth in developing and emerging economies worldwide (Soetiono & Setiawan, 2018).

The debate among researchers centres on whether the assumption that digitalisation significantly influences financial inclusion is valid. Digital transformation and financial inclusion have emerged as critical topics in various Asian countries, particularly because a substantial portion of the population still lacks access to formal financial services. In Southeast Asia, financial inclusion has shown positive growth, partly driven by the widespread adoption of electronic money (Asongu et al., 2021; Zins & Weill, 2016). However, it remains uncertain whether this growth can be directly attributed to advancements in digital transformation.

Digital transformation is widely regarded as a potential solution to the challenges of accessing financial services, particularly in overcoming administrative barriers in rural markets that remain underserved by conventional financial institutions (Kumaraswamy & Nègre, 2022). Research conducted in Nigeria by Adetunji et al. (2019) highlights the positive effects of education and income on financial inclusion. Additionally, existing studies

employ various metrics to approximate digital transformation. For instance, Asongu et al. (2021) and Nchofoung and Asongu (2022) use information and communication technology to examine the vital role of digital transformation in developing Africa's financial sector.

On the other hand, Anarfo (2018) argues that digital transformation involves advancements in digital technology, including communication devices, mobile phones, internet penetration, computers, networks, and related innovations. Technological growth has facilitated financial service transactions through the transformation of information, process automation, and the accelerated flow of financial transactions globally and within various Asian banking sectors (Nakagawa et al., 2023). In Southeast Asian countries, the foundation for financial development and inclusive growth is strongly tied to the expansion of digital technology. Despite an increase in the availability of financial services in the region, the level of provision remains relatively low compared to European countries, with over half of the population excluded due to poverty and income inequality. Notable successes have been achieved in leveraging digital technology, particularly mobile money transfers, which reduce transaction costs and facilitate purchases. However, significant challenges persist, including high illiteracy rates and the substantial expenses associated with technological infrastructure and services. Many of the population lacks the education and knowledge necessary to fully utilise the opportunities offered by digital technology.

This study builds upon recent research highlighting the role of digital transformation in overcoming infrastructure barriers to financial inclusion. For instance, Lee et al. (2021) underscore the significance of mobile banking in rural communities. While acknowledging country-level heterogeneity—such as differences in regulations, infrastructure, culture, and financial literacy—this study argues that digital transformation is pivotal in enhancing financial inclusion. Drawing on innovation diffusion theory, the study examines the impact of digital transformation on financial inclusion within a macroeconomic context. Analysing international data can identify critical points where digital transformation significantly contributes to financial inclusion.

This study focuses on the influence of digital transformation on financial inclusion in Southeast Asia, aiming to understand the role of technological innovation in improving community access to financial services and addressing the accompanying challenges and opportunities. It seeks to provide deeper insights into the development of financial digitisation in the

region and its impact on the policy frameworks supporting broader financial inclusion. Furthermore, the study emphasises the importance of financial development and investment in ensuring financial services' affordability while addressing concerns about the financial system's stability amidst technological advancements and increasing competition.

This study contributes to various aspects of the field. First, to the best of our knowledge, it is the first study to examine the influence of digital transformation on financial inclusion by calculating a digital transformation index using multiple sub-index indicators. The closest comparable study is that of Asongu et al. (2021), which investigated the impact of technology on financial inclusion but focused exclusively on ICT indicators. Second, this study extends the analysis to financial inclusion indicators across three dimensions: penetration, availability, and usage, and explores how these dimensions are influenced by digital transformation. This approach contrasts with earlier studies, such as those by Odugbesan et al. (2022), Bansal (2014), and Lenka and Barik (2018), which restricted their measures of financial inclusion to fewer dimensions.

The remainder of this paper is structured into five sections. Section 2 reviews the relevant theoretical literature and empirical findings on the relationship between digital transformation and financial inclusion. Section 3 describes the data and methodology employed. Section 4 presents and discusses the results, while Section 5 concludes the study and offers policy implications from a research perspective.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This section begins with the theoretical foundation, where several studies have sought to establish a framework for financial inclusion. The public goods approach to financial inclusion suggests that formal financial services should be treated as a public good, accessible to all for collective benefit. This perspective places responsibility on governments to promote financial inclusion. Currently, the relevance of digital finance and financial inclusion in poverty alleviation and economic growth has gained the attention of policymakers, particularly due to challenges that, if addressed, could enhance the efficacy of digital finance for individuals, businesses, governments, and the economy (Ozili, 2021b). Another perspective, the financial literacy approach, emphasises the importance of fostering awareness about basic financial services within the economy rather than relying on public funds (Ozili, 2020a; Staschen & Nelson, 2013). In this context,

leveraging digital transformation in the financial sector offers a promising strategy for raising awareness. Digital finance and financial inclusion provide several advantages for users, financial service providers, governments, and the broader economy. These benefits include improving financial access for underserved populations, reducing financial intermediation costs for banks and fintech providers, and increasing aggregate government spending (Ozili, 2020b).

Empirical studies have extensively examined banking sectors across various Asian countries, focusing on financial development, economic growth, inequality, and financial inclusion. However, a significant research gap exists regarding the role of digital transformation. The growing interest in financial inclusion stems from its potential to drive inclusive growth and financial sector development (Anarfo et al., 2019).

Senou et al. (2019) investigated this topic using data from the Central Banks of West African States (BCEAO) and the International Telecommunication Union (ITU). Employing the GMM system developed by Arellano-Bond to address endogeneity issues in the static model, their findings indicate that digital transformation variables, such as mobile phones and the Internet, positively influence financial inclusion in WAEMU countries. Notably, digital finance significantly impacts financial inclusion through mobile money and mobile banking tools. However, the study also reveals a negative effect of the Internet on financial inclusion, attributed to constraints in accessibility, availability, and affordability, which hinder its broader adoption.

Existing studies on digital transformation and development indicators have primarily focused on the impact of technological advancements on financial inclusion and its expansion. Yang and Masron (2023) conducted a study using the GMM-two-step estimator method and data from 118 banks in China between 2014 and 2021 to investigate this relationship. The empirical findings suggest a positive interaction between digital transformation and digital financial inclusion, indicating that financial inclusion influences digitisation to some extent, thereby enhancing bank profitability. A heterogeneity analysis using a fixed-effects model reveals that banks with higher digital transformation indices engage more effectively with financial inclusion. These findings imply that financial inclusion serves as a bridge between digital transformation and improved bank performance.

Despite these studies' valuable contributions, digital transformation's impact on financial inclusion remains underexplored, particularly in Southeast Asia. The novelty of this article lies in its comprehensive analysis of digital transformation and financial inclusion, focusing on Southeast Asian economies from 2012 to 2021. employs the Digital Transformation Index (DTI), divided into

various sub-indices as outlined by Tiutiunyk et al. (2021), to provide a more detailed understanding of how specific aspects of digital transformation influence financial inclusion.

Furthermore, this article addresses the potential vulnerabilities of the financial sector in Southeast Asia stemming from the adoption of digital technology, a topic insufficiently explored in existing literature. It examines the collaborative efforts of governments and financial institutions in the region to develop policies that enhance access to financial services, thereby promoting broader financial inclusion. While the growth in the number of account holders is often considered a key indicator of financial development in various regions, this study also explores the financial sector's vulnerability to risks such as attacks and instability resulting from adopting digital technology. Collaborative efforts by governments and financial institutions in Southeast Asia aim to create an environment conducive to financial inclusion by formulating policies that facilitate access to financial services. Digital financial services are widely regarded as a safer, more convenient, and more secure alternative to storing money at home or carrying cash (Villasenor et al., 2015). Financial inclusion is expected to contribute significantly to poverty reduction, economic growth, and improved financial stability (Hannig & Jansen, 2010).

Ong et al. (2023) confirm that the digitalisation of business transactions positively influences financial inclusion in lower- to middle-income ASEAN economies. The positive effect suggests that digitalisation may be pivotal in driving economic growth within these segments. This study supports the argument that an inclusive financial system fosters inclusive growth, which is closely linked to improvements in institutional quality. The faster lower- to middle-income ASEAN economies converge with higher-income ASEAN countries, the sooner ASEAN can form a more integrated community. Achieving such integration is critical to realising the ASEAN Community by 2025.

The uniqueness of this study lies in its comprehensive approach to assessing the impact of digital transformation on financial inclusion, employing a robust index with multiple sub-indices. It builds on existing literature by systematically analysing digital transformation's role in enhancing financial inclusion while addressing the specific opportunities and challenges faced by Southeast Asian economies. The findings are expected to significantly contribute to policy discussions and strategies to promote financial inclusion through digital transformation.

METHODOLOGY

Data

The study employs secondary data spanning 2012 to 2021, sourced from the World Development Indicators and the International Monetary Fund, focusing on Southeast Asian countries. The research sample includes eight Southeast Asian countries, with Timor Leste, Cambodia, and Laos excluded due to data availability constraints.

The study examines financial inclusion as the dependent variable, assessed across three dimensions: penetration, availability, and usage. Commonly used indicators in the literature were selected for computation to ensure reliability. The primary independent variable is the Digital Transformation Index (DTI), which is derived from four sub-indices: financial development, global innovation, digital competitiveness, and ICT development, along with a composite indicator that integrates these factors. These indicators, previously utilised by authors such as Sha'ban et al. (2020) and O. Evans (2016a), are expected to positively influence financial inclusion, aligning with the view that technology serves as a pathway to achieving financial development and inclusive finance.

To analyse financial inclusion in Southeast Asia, the study incorporates control variables, including GDP per capita, foreign direct investments (FDI), and interest rates. These variables are widely recognised in the literature as significant determinants. The inclusion of FDI is informed by Odugbesan et al. (2022), who identified its positive impact on financial inclusion. Similarly, Evans and Alenoghena (2017) regard economic growth as a determinant with an expected positive influence on financial inclusion. Conversely, interest rates are anticipated to negatively affect financial inclusion.

Model Specification

The selected methodological approach for panel data regression analysis is tailored to the dataset and the reliability of relationships among variables. Three primary approaches are utilised: the Pooled Ordinary Least Squares (OLS) approach, the Fixed Effects Model (FEM), and the Random Effects Model (REM). The choice between FEM and REM depends on the specific characteristics of the data and the research objectives. The Hausman test is employed to determine the most suitable model, examining whether the unique errors correlate with the regressors. This test assesses the presence or absence of endogeneity to decide between FEM and REM. Similarly, the Chow test is applied to choose between the Common Effects Model (CEM) and FEM by evaluating the significance of individual-specific effects, which aids in determining whether to include these effects or assume homogeneity across entities. These statistical tests are critical for selecting an appropriate model that accurately analyses the relationships between variables in the context of panel data.

The study uses the following general panel data regression function:

$$FI_{i,t} = f(DTI_{i,t}, Findev_{i,t}, INV_{i,t}, LNGDPPC_{i,t}, IR_{i,t}) \quad (1)$$

FI represents financial inclusion, assessed through penetration, availability, and usage. The (Digital Transformation Index) is defined by Equation (2). Equations (3), (4), and (5) delineate financial inclusion dimensions: penetration (FIP), availability (FIA), and usage (FIU), respectively. All models include control variables such as Foreign Direct Investments (INV), Financial Development (Findev), GDP per capita (GDPPC), and Interest Rate (IR). In the panel analysis, i represents the country-specific effect, t denotes the time-specific constant, $\varepsilon_{i,t}$ is the error term, and τ is the lagging coefficient.
Model:

Model 1

$$LNFIP_{i,t} = \beta_1 + \beta_2 DTI_{i,t} + \beta_3 Findev_{i,t} + \beta_4 INV_{i,t} + \beta_5 LNGDPPC_{i,t} + \beta_6 IR_{i,t} + \varepsilon_{i,t} \quad (2)$$

Model 2

$$LNFIA_{i,t} = \beta_1 + \beta_2 DTI_{i,t} + \beta_3 Findev_{i,t} + \beta_4 INV_{i,t} + \beta_5 LNGDPPC_{i,t} + \beta_6 IR_{i,t} + \varepsilon_{i,t} \quad (3)$$

Model 3

$$FIUD_{i,t} = \beta_1 + \beta_2 DTI_{i,t} + \beta_3 Findev_{i,t} + \beta_4 INV_{i,t} + \beta_5 LNGDPPC_{i,t} + \beta_6 IR_{i,t} + \varepsilon_{i,t} \quad (4)$$

Model 4

$$FIUL_{i,t} = \beta_1 + \beta_2 DTI_{i,t} + \beta_3 Findev_{i,t} + \beta_4 INV_{i,t} + \beta_5 LNGDPPC_{i,t} + \beta_6 IR_{i,t} + \varepsilon_{i,t} \quad (5)$$

Several key indicators are defined to evaluate and analyse financial inclusion, digital transformation, and economic development in this context. The Natural Logarithm of Financial Inclusion Penetration (LNFIP) measures the extent of financial inclusion, while the Natural Logarithm of Financial Inclusion Availability (LNFIA) represents the accessibility of financial services. Financial Inclusion Usage is divided into Deposit (FIUD) and Loan (FIUL) components, highlighting utilisation patterns within the financial inclusion framework. The Digital Transformation Index (DTI) captures technological advancement, while the Financial Development Index (Findev) provides insights into the overall

financial ecosystem. The Foreign Direct Investment to Gross Domestic Product (INV) assesses the influence of international investments on economic performance. The Natural Logarithm of GDP per Capita (LNGDPPC) indicates economic prosperity, and the Policy Interest Rate (IR) serves as a key determinant of economic policies. Cross-section (i) and Time Series – Year (t) represent variables used for specific analytical dimensions. Coefficients of regressor variables (β1,...,6) denote the influencing factors within the regression model, while the error term (ε) accounts for unobserved factors that may affect the accuracy of the analysis.

These indicators provide a comprehensive framework for understanding and evaluating financial inclusion, digital transformation, and economic dynamics.

Table 1: Descriptive Statistics

Variables	Mean	Med.	Max.	Min.	Std. Dev.	Obs.
Financial Inclusion Penetration	1137.969	830.514	2587.482	142.957	775.264	80
Financial Inclusion Availability	10.252	9.184	23.018	1.860	5.294	80
Financial Inclusion Usage-Deposit	77.017	70.980	232.683	13.400	40.283	80
Financial Inclusion Usage-Loan	67.796	54.464	280.891	5.400	48.885	80
Digital Transformation Index	6.342	6.551	11.702	0.004	2.701	80
Financial Development	0.373	0.267	0.762	0.092	0.268	80
Investment	5.579	3.082	32.691	-1.321	7.288	80
GDP per Capita	11930.390	3340.051	67175.860	1041.226	17704.990	80
Interest Rate	5.683	4.859	28.054	-8.631	4.946	80

Source: EVIEWS 9, data processed in 2023.

Table 1 comprehensively summarises the descriptive statistics for each variable analysed in this study. The dataset, processed using EVIEWS 9 in 2023, includes 80 observations. Financial Inclusion Penetration exhibits a mean of 1137.969, a median of 830.514, a maximum value of 2587.482, and a minimum of 142.957. The maximum value of 2587.48 indicates that some countries have significantly higher penetration of financial services, while the minimum value of 142.957 highlights areas with limited access. The substantial standard deviation (775.26) reflects considerable variability in financial inclusion penetration across the sample, indicating notable disparities between countries.

Similarly, financial inclusion availability has a mean of 10.252 and a median of 9.184, ranging from a minimum of 1.860 to a maximum of 23.018. The

Usage-Deposit and Usage-Loan components of Financial Inclusion show means of 77.017 and 67.796, respectively, with differences in their medians, maximum, and minimum values. The Digital Transformation Index, which measures technological advancement, has a mean of 6.342 and ranges from 0.004 to 11.702. Financial Development (Findev) records a mean of 0.373, with values ranging from 0.092 to 0.762. Investment, represented as the ratio of Foreign Direct Investment to GDP (INV), has a mean of 5.579 and ranges from -1.321 to 32.691.

GDP per capita shows considerable variation, with a mean of 11,930.390, a median of 3340.051, and a range from 1041.226 to 67,175.860. Lastly, the Interest Rate variable (IR) exhibits a mean of 5.683, ranging from -8.631 to 28.054.

This detailed set of descriptive statistics provides a strong foundation for the subsequent analysis of the variables considered in this study.

FINDINGS AND DISCUSSION

Table 2 illustrates the correlation between the digital transformation index (DTI) and financial inclusion across Southeast Asian countries during the study period. The analysis indicates a positive association between digital transformation and financial inclusion, specifically in terms of penetration, availability, and usage indicators. The results highlight the favourable impact of digital transformation on financial inclusion levels.

Tabel 2: Correlation Test

Model 1: *Dependent Variable – Natural Logarithm of Financial Inclusion Penetration*

	LNFIP	*DTI*	*Findev*	*INV*	*LNGDPPC*	*IR*
LNFIP	1.0000					
DTI	0.3091	1.0000				
Findev	-0.1275	-0.4419	1.0000			
INV	-0.2010	0.5207	-0.3847	1.0000		
LNGDPPC	-0.1014	0.0817	0.0128	0.0527	1.0000	
IR	-0.2125	-0.5728	0.0988	-0.1698	-0.0798	1.0000

Model 2: *Dependent Variable – Natural Logarithm of Financial Inclusion Availability*

	LNFIA	*DTI*	*Findev*	*INV*	*LNGDPPC*	*IR*
LNFIA	1.0000					
DTI	0.2365	1.0000				
Findev	-0.0777	-0.4419	1.0000			
INV	-0.1381	0.5207	-0.3847	1.0000		
LNGDPPC	-0.0551	0.0817	0.0128	0.0527	1.0000	
IR	-0.0529	-0.5728	0.0988	-0.1698	-0.0798	1.0000

Model 3: *Dependent Variable – Financial Inclusion Usage – Deposit*

	FIUD	*DTI*	*Findev*	*INV*	*LNGDPPC*	*IR*
FIUD	1.0000					
DTI	0.6943	1.0000				
Findev	-0.5714	-0.4419	1.0000			
INV	0.7150	0.5207	-0.3847	1.0000		
LNGDPPC	0.0462	0.0817	0.0128	0.0564	1.0000	
IR	-0.3501	-0.5728	0.0988	-0.1698	-0.0.798	1.0000

Model 4: *Dependent Variable – Financial Inclusion Usage – Loan*

	FIUL	*DTI*	*Findev*	*INV*	*LNGDPPC*	*IR*
FIUL	1.0000					
DTI	0.7206	1.0000				
Findev	-0.5303	-0.4419	1.0000			
INV	0.6788	0.5207	-0.3847	1.0000		
LNGDPPC	-0.0288	0.0817	0.0128	0.0527	1.0000	
IR	-0.3963	-0.5728	0.0988	-0.1698	-0.0798	1.0000

The results of the four financial inclusion models were assessed using the Panel Least Squares method, and the summarised findings are provided in Table 3. Panel A of Table 3 outlines the detailed outcomes of the selected models for LNFIP, LNFIA, FIUD, and FIUL.

The Chow test results, with a probability value of 0.000 (below the 0.05 significance level), indicate that the Fixed Effect Model (FEM) is superior to the Common Effect Model (CEM). This conclusion is further supported by the Hausman test, which yields a probability value of 0.00, rejecting the null hypothesis and confirming the superiority of the FEM over the Random Effect Model (REM). Consequently, the Fixed Effect Model (FEM) is adopted for the analysis in this study.

Transitioning to Panel B in Table 3, the results of the panel data regression indicate that the Digital Transformation Index (DTI) has a positive and statistically significant impact on financial inclusion. This finding aligns with the studies of Sha'ban et al. (2020), Turvey and Xiong (2017), and Evans (2016b), which highlight the positive effects of digital transformation on financial inclusion. Digital transformation enhances access to financial services, particularly for underserved or remote populations, enabling a broader segment of society to engage in formal financial activities such as banking, payments, and investments.

However, it is important to note that the DTI exhibits a notable negative and non-significant impact on certain dimensions of the financial inclusion equations. This suggests that the effects of financial development vary across different indicators of financial inclusion in Southeast Asian countries. Individuals who lack access to or are uncomfortable with digital technologies may face exclusion from digital banking services. Such exclusionary dynamics could reduce outstanding loans and deposits, particularly among groups with limited digital accessibility.

Interestingly, this finding contrasts with prior research, such as that of Fanta and Makina (2019), Kouladoum et al. (2022), and Yakubi et al. (2022), which reported a positive relationship between digital technology and financial inclusion in the African banking sector. Similarly, studies using comparable metrics, such as Anarfo (2018), have highlighted a positive trend, underscoring the need for further investigation into the unique regional dynamics of digital transformation and its influence on financial inclusion.

Table 3: Summary of Estimation Output

Panel A: The Best Model Selection				
	LNFIP	**LNFIA**	**FIUD**	**FIUL**
Chow Test	173.942 (0.000)	219.487 (0.000)	100.092 (0.000)	103.915 (0.000)
Hausman Test	47.741 (0.000)	25.649 (0.000)	24.067 (0.000)	48.469 (0.000)
Decision	FEM	FEM	FEM	FEM
Panel B: Estimation Output (Fixed Effect Model)				
Regressor	**LNFIP**	**LNFIA**	**FIUD**	**FIUL**
Constant	5.453 (8.177)	1.696 (4.544)	74.323 (2.325)	76.247 (1.928)
DTI	-0.037 (-1.135)	0.044** (2.433)	2.921* (1.888)	4.494** (2.349)
FINDEV	4.620 *** (3.009)	0.634 (0.739)	73.996 (1.005)	55.104 (0.605)
INV	0.016 (1.013)	-0.006 (-0.616)	2.685*** (3.505)	4.170*** (4.401)
LNGDPPC	-0.030 (-1.178)	-0.006 (-0.409)	-2.254* (-1.818)	-2.414 (-1.575)
IR	-0.007 (-0.831)	0.008* (1.844)	-0.362 (-0.951)	-0.547 (-1.162)
R2	0.920	0.947	0.918	0.915
F-stats.	64.124***	100.134***	62.333***	59.825***
Panel C: Intercept				
Country	**LNFIP**	**LNFIA**	**FIUD**	**FIUL**
_BRUNEIDARUSSALAM--C	1.109	0.843	-5.618	-32.018
_INDONESIA--C	1.401	0.753	-13.439	-8.136
_MALAYSIA--C	2.062	0.175	52.589	73.981
_MYANMAR--C	-2.798	-0.855	-77.876	-82.375
_SINGAPORE--C	0.706	0.043	53.343	38.037
_THAILAND--C	-0.955	-0.016	-18.380	7.155

_FILIPINA--C	-1.819	-0.230	-44.632	-43.080
_VIETNAM--C	0.293	-0.713	54.013	46.436

*, ** and *** significance levels at 10%, 5%, and 1%.
Source: EVIEWS 9, data processed in 2023.

Foreign direct investments (FDI) have a positive and statistically significant impact on the usage indicator of financial inclusion but show no significant effect on penetration. Additionally, FDI appears to have an insignificant effect on availability, suggesting that financial development influences different financial inclusion indicators variably across Southeast Asian countries. The positive effect of FDI on the usage dimension of financial inclusion can be attributed to its ability to stimulate economic growth and development, resulting in increased income levels and business activities. Consequently, individuals and businesses may demand higher financial services, such as loans and deposit facilities, to support their expanding economic activities. This heightened economic activity, in turn, drives greater utilisation of financial inclusion services. These findings align with the results of Ozili (2021), which demonstrate that increased usage of debit cards, credit cards, and digital financial products can reduce risks in the financial sectors of developed and advanced economies, though the same effects are not observed in transitional and developing economies.

The findings on financial development indicate a positive and significant impact on penetration, although certain models reveal an insignificant effect on other dimensions of financial inclusion. This suggests that while financial development can positively contribute to overall financial inclusion, its effectiveness may vary depending on the measured indicators or dimensions. Consequently, a targeted and comprehensive approach to financial development initiatives may be necessary to address aspects of financial inclusion that do not respond significantly to general financial development efforts.

The presence of a negative effect of GDP per capita across all models suggests that the growth of Gross Domestic Product (GDP) in Southeast Asian countries is inversely related to the level of individual participation in financial services. This observation aligns with the conclusions of Li et al. (2020), who noted that digital finance positively correlates with household expenditure on food, clothing, housekeeping, health care, education, and entertainment. In terms of consumption structure, digital finance especially encourages recurring household spending over non-recurring spending. Further analysis by Li et al. (2021) using a mediation model identified online shopping, digital payments, online credit acquisition, Internet-based financing products, and business insurance as key

mediating variables influencing the relationship between digital finance and household consumption.

The negative relationship between GDP per capita and financial inclusion implies that individual engagement with financial services declines as GDP per capita increases. This phenomenon may be attributed to various factors. One plausible explanation is that a high level of inclusive finance could lead to increased lending rates driven by substantial demand for funds. Over time, this might adversely affect businesses, as excess capital may not be actively sought or effectively utilised within the economy. These findings highlight the complex dynamics between economic growth, individual financial participation, and the potential consequences of a highly inclusive financial environment in Southeast Asian countries.

The findings also reveal that interest rates positively and significantly impact financial inclusion, particularly in the availability dimension. A key advantage of well-managed interest rates is their ability to incentivise financial institutions to expand their services to a broader population. Higher interest rates can also encourage individuals to save money in formal banking systems, thereby increasing the use of formal financial services.

CONCLUSION AND RECOMMENDATIONS

This study examined the impact of digital transformation on financial inclusion in Southeast Asian countries from 2012 to 2021. The analysis utilised a Digital Transformation Index (DTI) comprising sub-indices such as the Global Innovation Index, ICT Development Index, and Digital Competitiveness Index. Financial inclusion was assessed through penetration, availability, and usage key variables, including GDP, financial development, foreign direct investment (FDI), and interest rates—commonly recognised in the literature as determinants of financial inclusion—were incorporated. Panel data regression techniques were employed to address diverse estimation challenges. The findings revealed that the DTI has a positive and statistically significant impact on financial inclusion in Southeast Asian countries. Based on these results, the study offers several policy recommendations. Policymakers are encouraged to prioritise investments in digital infrastructure, focusing on advancing information and communication technology (ICT) and fostering global innovation. These efforts should aim to enhance digital connectivity and accessibility, thereby facilitating broader adoption of digital financial services across the region. Addressing these digital infrastructure needs proactively can promote financial inclusion and support broader socioeconomic development in Southeast Asian countries.

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