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The Role of Availability of Financial Institutions and Financial Innovation on the Financial Inclusion: Does Digital Finance Moderate this Linkage?

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Abstract: In recent years, financial inclusion has been the most critical factor for effective economic growth (EG), which could be attained through the availability of financial institutions and financial innovation. Due to its increased significance, this study investigates the effect of the availability of financial institutions, digital finance, and financial innovation on financial inclusion in ASEAN nations. In addition, this study investigates the moderating effect of digital finance on the availability of financial institutions, financial innovation, and financial inclusion in ASEAN nations. Population and economic growth were also used as control variables in the study. From 2007 to 2021, the researchers utilized secondary data extracted from the World Development Indicators (WDI) database. The researchers also employed the cross-sectional augmented distributed latency (CS-ARDL) method to examine the relationship between the variables. Financial inclusion was positively correlated with the availability of financial institutions, digital finance, population growth, and financial innovation. In addition, digital finance moderates the relationship between the availability of financial institutions, financial innovation, and financial inclusion substantially. The research guides regulators in developing regulations to enhance financial inclusion through digital finance, financial innovation, and financial institutions.

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1. Introduction

Every nation has its financial system, which consists of banking institutions, insurance companies, financing institutions, stock exchanges, etc., that deal in money and provides financial services to individuals. Most of the population's inability to access and utilize financial services and products is still admissible. This is due to the absence of affordability, transportation, time management, and service quality. (Dinh et al., 2022; Le et al., 2020) Financial inclusion is the initiative to assure the availability of financial services to people and their access to financial services by reducing barriers. Financial inclusion significantly impacts a nation's development, economic growth, and general welfare. Financial inclusion benefits the economy by providing capital to businesses through loans, credits, investments, or other special funds. Financial inclusion facilitates the transfer of funds across a region and currency interchange. The economic development of a nation is determined by the financial progress brought about by financial inclusion. Businesses start, expand, and thrive in a nation where financial inclusion is implemented. Companies can reduce their problems and surmount their apprehension of risks and losses. Therefore, financial inclusion helps a nation achieve competitive advantages over other economies (Duong et al., 2022; Younas et al., 2022). As financial inclusion facilitates money transfer and currency exchange, it promotes trade within the country and facilitates its expansion to the international market. Foreigners' trust, foreign investment, and foreign earnings contribute to the country's overall economic development if there is financial inclusion (Malik et al., 2022; Nguyen et al., 2021).

Financial inclusion removes obstacles that prevent people from gaining access to and benefiting from financial services to achieve their objectives. It aims to increase the number of rural and urban residents who can access financial services. Financial inclusion can be affected by factors such as the availability of financial institutions, financial innovation, and digital finance (Ferrata, 2019). People cannot access financial services in rural and many other remote urban areas. They encounter obstacles such as a lack of information about the source of financial services, high transportation costs, and time constraints. When work is done to establish financial institutions in these areas, interested parties become aware of the accessibility of financial services in adjacent areas and the methods for interacting with these services. Thus, financial inclusion exists in these regions (Chen et al., 2023; Demir et al., 2022).

Financial innovation is developing new products, services, and/or procedures. Innovative technologies, risk management, credit and equity generation, money transfer, and numerous other innovations are included in these alterations. Some individuals lack knowledge of financial products and services, many do not fully utilize these services, and some are still unable to manage their finances properly. Financial innovation enhances the quality of financial services, advertising, and marketing. Thus, it contributes to the financial inclusion 2020 publication by Koomson, Villano, and Hadley. Digital financing provides conventional financial services via digital devices such as computers, laptops, iPads, smartphones, and smartwatches. Digital finance has the potential to make financial services available to marginalized populations in areas where physical infrastructure for financial services is lacking (Chien, 2023; Lu et al., 2022).

This research intends to investigate financial inclusion in the ASEAN economy. ASEAN is the Association of Southeast Asian Nations, founded in 1967 when Indonesia, the Philippines, Thailand, Singapore, and Malaysia joined forces. With time, the association's membership grew to ten countries, including Brunei Darussalam, Cambodia, Vietnam, Myanmar, and Laos, with Papua New Guinea as its supervisor. ASEAN was founded to accept global challenges and accelerate regional economic development rates. The region's total GDP of $3.35 trillion demonstrates that it has become the fifth-largest economy in the world (Banna & Alam, 2021; Moslehpour et al., 2022c). The industrial supply chain development in ASEAN is expanding, particularly in Vietnam, Cambodia, Laos, Myanmar, and other sectors, due to the region's increasing population and decreasing wage rate. To strengthen the economy, ASEAN, like other nations, requires a robust financial system and expansion of financial services throughout the region (Chien et al., 2023b; Loo, 2019; Moslehpour et al., 2022a; Phuoc et al., 2022).

Financial inclusion is crucial to achieving ASEAN's Vision 2025 to develop the country from human, social, and economic perspectives. Financial inclusion contributes to achieving Vision 2025's economic objectives in ASEAN nations. It aids in the development of country regulations and financial infrastructure. It supports the micro, small, and medium-sized enterprise (MSMEs) sector and facilitates the flow of capital, labor, products, and services (Bai et al., 2022; Nguyen & Du, 2022). Financial inclusion functions as a foundation for reducing poverty and inequality, resulting in inclusive economic growth and human capital for the nation. Financial inclusion can be a powerful catalyst for developing an integrated economic community in ASEAN. Effectively implemented financial inclusion can stabilize the financial sector, promote eco-financing in the region, prevail in financial access and literacy, provide financial education, safeguard consumer rights, and lower financial costs (Chau et al., 2022; Raimi et al., 2022).

Even though the ASEAN Working Committee on Financial Inclusion (WC-FINC) has established a framework for attaining the region's financial inclusion goals and implementing initiatives to realize the vision, there is still a need to find more effective means of achieving the desired outcomes. This research is a step toward the financial inclusion objective. This study aims to investigate the effects of the availability of financial institutions and financial innovation, along with demographic and economic variables, on financial inclusion. The study's objective is also to evaluate the impact of digital finance on the availability of financial institutions, financial innovation, and financial inclusion (Chien et al., 2022; Chien et al., 2023a; Nguyen et al., 2022a; Nguyen et al., 2022b; Sadiq et al., 2023).

However, numerous studies have debated the effects of financial institution availability, financial innovation, digital finance, population growth, and economic growth on financial inclusion. However, these studies have provided individual explanations for the relationship between these factors and financial inclusion. This article contributes to the literature by simultaneously analyzing the function of financial institution availability, financial innovation, digital finance, population growth, and economic growth in financial inclusion. Second, the relationship between digital finance and financial inclusion has been the subject of previous research. Rarely has the function of digital finance as a moderator between the availability of financial institutions, financial innovation, and financial inclusion been examined. This study closes the cavity in the literature by shedding light on the moderating effect of digital finance on the relationship between the availability of financial institutions, financial innovation, and financial inclusion. Third, to realize the vision for sustainable development, ASEAN nations must implement a financial inclusion strategy; however, little research has been

conducted on financial inclusion in ASEAN nations. This article examines the role of the availability of financial institutions, financial innovation, digital finance, population development, and economic growth in the financial inclusion of ASEAN nations.

This investigation is divided into six sections: The literature review follows the introduction. This section discusses the relationship between the factors through a literature review. The third section provides specifics regarding the research methodology. In the fourth section, information is evaluated, and results are extracted. In the discussion section, the obtained results are compared with identical findings from prior research. In the final section, the implication, conclusion, and limitations of the study are presented.

2. Literature Review

Financial inclusion expands the financial system and services to every corner of the nation by removing economic and social obstacles to obtaining financial services such as investments, credits, loans, money transfers, money exchange, financial risk management, etc. It is an accurate predictor of economic growth with advancement and expansion in all sectors, as well as social development and the well-being of the people (Demir et al., 2022; Hsu & Chien, 2023). However, financial inclusion requires initiatives like access to financial institutions, financial innovation, and digital finance. These initiatives bridge the divide between individuals and the financial system, allowing individuals to access financial services and manage their finances. Consequently, financial inclusion can be implemented effectively (Hsu et al., 2023; Van et al., 2021). It has been extensively discussed how the availability of financial institutions, financial innovation, digital finance, population development, and economic growth are related to financial inclusion. This study examines prior research to determine the connection between the availability of financial institutions, financial innovation, digital finance, population growth, economic development, and financial inclusion.

A country's financial system consists of numerous financial institutions. These institutions provide various financial services, including loan facilitation, credit, leasing, assurance, risk absorption, savings, and investments. The presence of these institutions enables the local populace to interact with their representatives, obtain information, and acquire financial products and services. Therefore, financial institutions promote financial inclusion (Girón et al., 2021; Quynh et al., 2022). Assuming et al. (2019) conducted a study examining the connection between financial institutions' availability and financial inclusion. From 2011 to 2014, financial institutions and financial inclusion data in 31 Sub-Saharan African countries were collected using the Global Findex database. The study suggests that if the total number of financial institutions within a city increases and these institutions are willing to offer a variety of financial services to clients, firms will be able to access and utilize the financial services provided by the institutions to protect their reputation, increase their size, and conduct financial transactions with ease. Thus, financial inclusion is promoted. Demirgüc-Kunt et al. (2020) also clarify that the availability of financial institutions contributes to financial inclusion by facilitating the advertising and marketing of financial services over a greater geographical area.

There may be a shift in the requirements for financial services on the market. It mandates that financial institutions add value to their products or launch new services and products. This financial innovation enables institutions to increase their marketing efforts for financial products and services and to target a larger population. Consequently, in many regions of the nation, individuals may have access to and availability of financial services (Igwemeka et al., 2020). Using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and the Prospect theory, Senyo and Osabutey (2020) examined the relationship between financial innovation and financial inclusion. SPSS software was used to perform descriptive statistics on data from 294 respondents. Using PLS-SEM and SmartPLS version 3.2.7, the measurement and structural modeling analyses were performed. The study hypothesizes that financial innovation enhances financial institutions' and clients' relationships. Therefore, it benefits the financial institution. Zauro et al. (2020) also note that when financial institutions maintain flexible financial policies and create novel strategies for channeling their services to consumers, they can better identify those in need. In addition, they can assist them in comprehending and following the procedures for accessing financial services without violating their rights. Innovations in marketing by financial institutions can advance financial inclusion (Kinjal Jethwani, 2022).

In many remote or rural areas, financial institutions are insufficient, and residents lack access to banking or financial services. The vast majority of individuals associated with the financial sector are highly grateful to digital services, which make it simple for them to provide financial services to people in remote villages even though they do not have branches there. Using mobile devices such as smartphones, laptops, etc., individuals can transfer funds, establish an account, save money, and make online purchases, among other financial transactions. (Kamarudin et al., 2021; Wang & Fu, 2022). Shofawati (2019) examines the role of digital finance in financial inclusion and the expansion of small- and medium-sized enterprises (SMEs). The data for digital finance in financial inclusion were obtained from Indonesian SMBs. According to the study, one of the primary factors is that individuals are unmotivated to continue using financial services, and institutions cannot increase the delivery of financial products and services. Adopting digital technologies enables financial institutions to provide financial services in seconds without using the physical infrastructure. Quickness enhances people's access to financial services, promoting financial inclusion. Digital finance, according to Barik and Sharma (2019), contributes to financial inclusion by enhancing service quality, increasing agility, and ensuring delivery to larger areas.

Digital financing enhances the administration of financial products and services, reduces risks, circumvents the expense of physical infrastructure, and boosts the marketing of these products and services. All of this enhances the capacity of proprietors of financial institutions to increase the number of branches in remote areas and broaden the scope of financial services. Therefore, digital financing strengthens the connection between the availability of financial institutions and financial inclusion (Al-Smadi, 2022; Lan et al., 2022). Risman et al. (2021) investigate the relationship between digital finance, the presence of financial institutions, and financial inclusion. The panel data set of 120 samples from Indonesian institutions was collected over a decade between 2009 and 2019. Eviews software was used for analysis techniques such as Univariate linear regression and Multiple Regression Analysis. The study explains that digital financing guarantees financial institutions' availability, improving financial inclusion. Xun et al. (2020) investigates the connection between digital finance, the availability of financial institutions, and financial inclusion. In the digital finance, where machines and the internet are used to interact with consumers, design their services, and conduct marketing practices, more financial institutions are accessible to a

region's natives, according to the study. Additionally, digital technologies facilitate financial inclusion. Thus, when digital finance is utilized, financial institutions can play a more significant role in promoting financial inclusion.

The implementation of digital finance enhances the information system and communication network. It promotes adopting financial innovation by providing high-quality information on novel financial technologies, market demands, and new financial services. The innovation in financial services broadens the scope of financial institutions and enables diverse individuals to interact with the institutions and utilize their services to manage better their financial transactions (Kofman & Payne, 2021; Lin et al., 2022). Li et al. (2021) investigates the intersection of digital finance, financial innovation, and financial inclusion. According to the study, the utilization of digital modalities of financing introduces innovation to banking products and services. Financial services, such as loans, credits, investments, leases, etc., are available to more individuals when financial institutions incorporate innovation into their routine operations. Therefore, digital finance connects financial innovation and financial inclusion. Yue et al. (2022) establish a connection between digital finance, financial innovation, and financial inclusion. China Household Finance Survey (CHFS) and Peking University's Digital Financial Inclusion Index (DFI) data were compiled from 2013 to 2017. The study asserts that the prevalent digital financing in the economy permits businesses to innovate their financial services and contribute to the financial inclusion of the economy.

The expansion of financial services depends on the population in various national regions. If a region's population continues to grow, the study suggests that regulators will pay attention to both physical and digital infrastructure. Members of the community and commercial institutions can thus attract financial institutions and obtain financial services. Population growth is crucial to financial inclusion (Liu et al., 2022; Uruakpa et al., 2019). The relationship between population growth and financial inclusion was integrated by Emara and El Said in 2021. From 1990 to 2018, annual population growth and financial inclusion data were collected from 44 emerging markets (EMs) and MENA. Using distinct metrics, private individuals' and organizations' financial access. Data were analyzed using the system's General Method of Moments (GMM). The authors believe that in areas with rapid population growth, financial institutions have a better outlook and are more likely to establish branches and introduce innovative financial products such as various types of loans, credits, investments, securities, and insurance. Consequently, population expansion increases financial inclusion.

The nation's economic development determines When a country is experiencing rapid economic growth. It prioritizes the economic conditions and well-being of its citizens. It attempts to satisfy the financial needs of individuals and businesses by making financial services accessible and available. Consequently, as the economy grows, financial inclusion increases (Akpa et al., 2022; Moslehpour et al., 2022b). Additionally, Chinnakum (2021) investigates the impact of economic development on financial inclusion. According to this study, a nation's economic growth determines its financial strength and the ability of financial institutions to increase the number of branches, broaden the range of financial products and services, and enhance the channels used to deliver services to customers. The active participation of financial institutions in their operations increases user access to financial services. Therefore, higher economic growth is indicative of greater financial inclusion. According to Nizam et al. (2020), an increase in the economic growth rate enhances the financial strength of banks, insurance companies, and fund-providing companies. It makes them more likely to offer financial services on favorable terms.

3. Method and Materials

The purpose of this study is to examine the impact of the availability of financial institutions, electronic governance, digital finance, population growth, and financial innovation on financial inclusion in ASEAN countries, as well as the role of digital finance as a moderator between the availability of financial institutions, financial innovation, and financial inclusion in the sample of ASEAN economies from 2007 to 2021. However, Brunei was excluded from the survey because no data were available. The study established the following equation:

$$FIN_t = \alpha_0 + \beta_1 AFI_t + \beta_2 FNIN_t + \beta_3 DF_{it} + \beta_4 PG_t + \beta_5 EG_t + \beta_6 AFI * DF_t + \beta_6 FNIN * DF_t + e_t \quad (1)$$

Where;

FIN	=	Financial inclusion
t	=	Time Period
i	=	Countries
AFI	=	Availability of Financial Institutions
FNIN	=	Financial Innovation
DF	=	Digital Finance
PG	=	Population Growth
EG	=	Economic Growth

The researchers used financial inclusion as proxies for the dependent variable financial inclusion index (Al-Smadi, 2021). In addition, the researchers considered two predictors, including the availability of financial institutions proxies such as account ownership at a financial institution by older adults (percentage of the population aged 25 and older) and financial innovation measured as the growth rate of the ratio of private credit to GDP (Laeven et al., 2015). In addition, the researchers employed a moderating variable called digital finance proxies as the number of ATMs per 100,000 adults (Al-Smadi, 2022). In addition, the researchers employed two control constructs, including population growth proxies as population growth (annual percentage) and EG proxies as GDP growth (annual percentage).

The researchers examine the specifics of the variables using descriptive statistics. Using a correlation matrix, researchers also evaluate the relationship between constructs. In addition, the researchers use the CSD test to examine the cross-sectional dependence (CSD). The equation is given as follows:

$$CSD_{IT} = \left[\frac{IT(T-1)}{2}\right]^{\frac{1}{2}} \hat{\rho}_T \quad (2)$$

In equation (2), $\hat{\rho}_T$ represented the coefficient correlation, T represented the time, and I represented the cross-sections.

The researchers also test the stationarity among constructs with the help of the CIPS unit root test. It is a suitable approach to test the unit root using panel data. The equation is mentioned below:

$$\Delta W_{i,t} = \emptyset_i + \emptyset_i X_{i,t-1} + \emptyset_i \bar{X}_{t-1} + \sum_{l=0}^{p} \emptyset_{il} \Delta \bar{W}_{t-1} + \sum_{l=0}^{p} \emptyset_{il} \Delta W_{i,t-1} + \mu_{it} \quad (3)$$

In equation (3), $\bar{W}$ represented the mean "cross-section" and mentioned below:

$$W^{i,t} = \emptyset^1 \overline{AFI}^{i,t} + \emptyset^2 FNIN^{i,t} + \emptyset^3 \overline{DF}^{i,t} + \emptyset^4 EG^{i,t} + \emptyset^5 \overline{PG}^{i,t} \quad (4)$$

Hence, the CIPS is mentioned below:

$$\widehat{CIPS} = N^{-1} \sum_{i=1}^{n} CADF_i \quad (5)$$

So, the CADF represented the cross-sectionally augmented dickey fuller test

The study also employed the co-integration test developed by Westerlund and Edgerton (2008) to examine the con-integration. This strategy is deemed effective due to the CSD assumption and structural fractures. In addition, this method investigates structural regime shifts and no-shift breaks. The equation is given as follows

$$llog(L) = \alpha_0 - \frac{1}{2}\sum_{i=1}^{N}\left(Tlog(\sigma_{i.t}^2) - \frac{1}{\sigma_{i,t}^2}\sum_{t=1}^{T} eit^2\right) \quad (6)$$

The CS-ARDL method is then used to examine the relationship between the variables. This methodology addresses slope heterogeneity, the CSD assumption, and endogeneity. The methodology is outlined by Chudik and Pesaran (2015). The equation is given as follows:

$$\Delta Y_{it} = \varphi_i + \sum_{l=1}^{p}\varphi_{it}\Delta Y_{i,t-1} + \sum_{l=0}^{p}\varphi_{il}' EIN_{s,i,t} + \sum_{l=0}^{1}\varphi_{il}'\overline{TO}_{i,t-1} + \varepsilon_{it} \quad (7)$$

Hence, the researchers have established the CS-ARDL equation using the under constructs:

$$\Delta FIN_{it} = \varphi_i + \sum_{l=1}^{p}\varphi_{it}\Delta FIN_{i,t-1} + \sum_{l=0}^{p}\varphi_{il}' AFI_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' FNIN_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' DF_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' PG_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' EG_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' AFI * DF_{s,i,t} + \sum_{l=0}^{p}\varphi_{il}' FNIN * DF_{s,i,t} + \varepsilon_{it} \quad (8)$$

4. Research Findings

According to Table 1, the mean value of FIN is 85.951%, the mean value of AFI is 45.711%, and the mean value of FNIN is 73.372. The research reveals that the mean value for DF is 35,653 ATMs per 100,000 adults, the mean value for PG is 1.218 percent, and the mean value for EG is 5.010 percent.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FIN	135	85.951	12.661	43.11	99.817
AFI	135	45.711	29.405	2.103	99.993
FNIN	135	73.372	45.136	3.471	165.001
DF	135	35.653	29.984	0.512	117.792
PG	135	1.218	0.805	-4.170	5.322
EG	135	5.010	3.908	-17.913	14.520

In addition, the researchers use country-specific descriptive statistics to examine the particulars of the constructs in each country. The findings indicate that FIN has the highest value in Malaysia, AFI has the highest value in Singapore, and FNIN has the highest value in Thailand. In addition, the research results indicate that DF has the maximum value in Thailand, PG in the Philippines, and EG in Laos.

Table 2. Country-wise Descriptives

	FIN	AFI	FNIN	DF	PG	EG
Cambodia	90.387	12.809	69.100	12.833	1.385	5.812
Indonesia	86.278	31.463	34.732	37.674	1.109	4.852
Lao	56.446	30.048	41.510	17.329	1.480	6.605
Malaysia	95.862	77.054	116.263	51.778	1.575	4.045
Myanmar	91.387	25.198	16.693	2.882	0.748	6.141
Philippines	94.512	34.215	38.303	22.183	1.726	4.838
Singapore	78.570	96.684	113.884	57.097	1.429	4.291
Thailand	92.185	78.808	136.193	98.258	0.511	2.547
Vietnam	87.931	25.118	93.675	20.841	0.995	5.958

According to Table 3, FIN will have the highest value in 2021, AFI will have the highest value in 2021, and FNIN will have the highest value in 2021. In addition, the research results indicated that DF would have the maximum value is 2021, PG in 2008, and EG in 2010.

Table 3. Descriptive statistics by years

	FIN	AFI	FNIN	DF	PG	EG
2007	77.554	37.592	51.366	19.135	1.701	7.895
2008	79.237	37.828	52.858	22.623	1.789	5.559
2009	81.027	38.156	57.988	25.092	1.497	3.044
2010	82.494	38.422	57.477	27.999	1.337	8.222
2011	84.495	40.620	60.678	30.380	1.353	5.713
2012	85.577	40.533	64.899	34.100	1.391	6.379
2013	86.205	41.206	70.706	36.731	1.275	5.927
2014	86.850	48.538	74.325	39.468	1.204	5.740
2015	87.500	45.880	78.258	41.078	1.173	5.214
2016	88.136	46.984	81.123	41.197	1.188	6.087
2017	88.777	52.458	82.340	42.889	1.029	5.915
2018	89.419	50.900	84.831	43.528	1.019	5.759
2019	90.060	52.232	87.455	43.919	1.052	5.047
2020	90.701	53.564	96.716	43.372	0.873	-2.668
2021	91.232	60.748	99.567	43.281	0.384	1.315

Moreover, Table 4 indicated that the availability of financial institutions, EG digital finance, population growth, and financial innovation are positively correlated with financial inclusion. In addition, the researchers also test the cross-sectional dependence (CSD) using the CSD test. The outputs in Table 5 show that the t-values and p-values fulfill the criteria. Hence, no CSD issue was detected.

CIPS unit root test results are mentioned in Table 6. The output indicated that the FIN, AFI, FNIN, and EG have no unit root at the level. In addition, the output indicated that the DF and PG have no unit root at first difference.

Table 7 indicates co-integration exists as t-values are more significant than 1.96 and p-values are lower than 0.05.

Table 4. Matrix of correlations

Variables	FIN	AFI	FNIN	DF	PG	EG
FIN	1.000					
AFI	0.131	1.000				
FNIN	0.291	0.739	1.000			
DF	0.229	0.802	0.770	1.000		
PG	0.180	-0.066	-0.173	-0.198	1.000	
EG	0.216	-0.326	-0.336	-0.335	0.070	1.000

Table 5. CSD analysis

Variable	Test Stat (prob-values)
FIN	3.451*** (0.000)
AFI	4.897*** (0.000)
FNIN	5.492*** (0.000)
DF	3.887***(0.000)
PG	7.892*** (0.000)
EG	5.489*** (0.000)

Table 6. Unit Root test

	I (0)			1st Difference I (1)	
Variables	CIPS	M-CIPS		CIPS	M-CIPS
FIN	-3.785***	-3.652***		----	----
AFI	-3.390***	-4.392***		----	----
FNIN	-5.784***	-5.882***		----	----
DF	----	----		-4.356***	-4.894***
PG	----	----		-4.288***	-3.493***
EG	-5.784***	-4.383***		----	----

Table 7. Co-integration Test

Test	Without break	Mean shift	Regime shift
Explained Variable: FIN			
$Z_{\varphi}(N)$	-3.289***	-4.541***	-5.687***
P_{value}	0.000	0.000	0.000
$Z_{\tau}(N)$	-4.570***	-4.901***	-5.688***
P_{value}	0.000	0.000	0.000

The researchers also utilized the CS-ARDL method to examine the relationship between the variables. According to Table 8, increased availability of financial institutions, digital finance, population growth, and innovation positively correlate with increased financial inclusion. In addition, digital finance has proven to significantly mediate the availability of financial institutions, financial innovation, and financial inclusion in ASEAN nations.

Table 8. CS-ARDL Short run and long run analysis

Long Run findings			
Variables	Coeff	t-stat	Prob
Explained Variable: FIN			
AFI	0.943***	3.201	0.000
FNIN	1.854***	4.849	0.000
DF	1.921**	2.102	0.026
PG	0.904**	2.223	0.019
EG	2.019***	5.309	0.000
AFI*DF	4.391***	5.674	0.000
FNIN*DF	0.827***	4.391	0.000
CSD-Statistics	-	0.043	0.543
Short Run Results			
AFI	1.982***	5.635	0.000
FNIN	2.381***	4.392	0.000
DF	2.101**	2.192	0.042
PG	1.202**	2.043	0.048
EG	0.483***	4.548	0.000
AFI*DF	0.478***	4.589	0.000
FNIN*DF	3.291**	2.192	0.038
ECT (-1)	-0.733***	-4.675	0.000

5. Discussions

Financial institutions have demonstrated a positive association with financial inclusion and are consistent with this association. According to a study by Duvendack and Mader (2020), if the number of financial institutions dealing in various financial services such as saving money, providing security for a variety of assets, granting various types of loans, and allowing credit facilities, etc., increases, residents will have more opportunities to obtain financial services to achieve their goals. Therefore, the presence of financial

institutions promotes financial inclusion. These results concur with Ozturk and Ullah's (2002) findings regarding the function of financial institutions in financial inclusion. The study suggests that if financial institutions are located nearby, people will not be limited to virtual interactions with their representatives and will experience fewer transportation difficulties. Contributing to financial inclusion, these individuals prefer to conduct their financial transactions through financial institutions. These outcomes are also consistent with Schuetz and Venkatesh's (2020) findings. This study demonstrates that if a substantial number of financial institutions are present in a city, individuals and businesses intend to utilize them to manage their financial affairs, promoting financial services within the country.

According to Xu et al. (2021), the adoption of innovation by financial institutions in their resources and techniques enables them to efficiently manage their system to provide financial products and services to clients. Operational efficiency enables institutions to serve their clients better. In this circumstance, more individuals have access to financial services. Additionally, Gruin and Knaack (2020) assert that when financial institutions incorporate innovative technologies, they consider clients' financial needs and learn how to meet the needs of financial product consumers. These institutions, which can provide a new range of services with assistance, enable more individuals to obtain loans, make investments, and perform efficient financial tasks.

Consequently, financial innovation enhances efforts to promote financial inclusion. These findings are also consistent with Lashitew et al. (2019)'s assertion that in many remote areas, residents are unaware of financial services and unable to benefit from them. Financial innovation increases knowledge and facilitates access to and utilization of financial services.

Financial inclusion is positively associated with digital finance. Durai and Stella (2019) also argued that, under digital financing, financial institutions use digital devices such as computers, laptops, tablets, and smartphones to market and deliver their financial products and services. This eliminates the physical and temporal barriers to people's access to financial services. Hence, digital finance promotes financial inclusion. These results are also consistent with Siddik and Kabiraj's (2020) assertion that, in the presence of digital financing methods, financial institutions can deliver services remotely to consumers of financial products and services. Therefore, more individuals can access financial services without making physical trips. This leads to financial inclusion when all country citizens have equal access to financial services. These findings are consistent with Rasheed et al. (2019)'s assertion that the use of digital technologies enables financial institutions to provide their services beyond the limitations of location and time, allowing the majority of the population access to financial services such as money deposits and withdrawals.

Population growth positively correlates with financial inclusion, corroborating Liu et al. (2022)'s conclusion that an increase in population results in improved human capital, sound financial management, and enhanced technological and physical infrastructure development. Thus, financial institutions can reach more deserving individuals and provide superior services. This affects financial inclusion. Also consistent with Lee et al. (2020) and Zhao et al. (2021) are these results. This study explains that regions with larger populations have more significant technological advancements and infrastructure development than regions with smaller populations. In these areas, financial inclusion is expanding. These results are also consistent with Dar and Ahmed (2021) and Zhao et al. (2022), who assert that if the population growth in some areas of a country increases, financial institutions will find profitable opportunities there and begin to market their services to the locals. This results in more individuals having access to financial services and a higher level of financial inclusion.

Omar and Inaba (2020) and Zhang et al. (2023a) substantiate the positive relationship between economic growth and financial inclusion. According to this study, whenever a nation obtains a higher economic growth rate, its financial system has advanced, can implement innovative techniques and digital technologies, and can expand its financial services. This circumstance increases the likelihood of rapid financial inclusion in the country. These results are also consistent with Ratnawati's (2020) assertion that economists and the government are in a position to invest in technological development and growth when the country is experiencing a higher rate of economic growth. This enhances digital communication and collaboration. In this circumstance, finances gain popularity among citizens. These findings are also consistent with Chinoda and Kapingura's findings from 2023, which suggest that higher economic growth, which raises income levels, fosters infrastructure development, and accelerates technological progress, can promote financial inclusion.

Results indicated that digital finance moderates the relationship between the availability of financial institutions and financial inclusion. Mhlanga (2020) and Zhang et al. (2023b), who examine the effects of digital finance on financial inclusion, support these findings. The study demonstrates that when financial institutions begin utilizing digital technologies for financing, they can expand bank facilities, thereby enhancing financial inclusion. Therefore, digital finance moderates financial institutions' availability and inclusion significantly. According to Chen and Yuan (2021) and Vu et al. (2023b), adopting digital finance expands financial institutions' reach and leads to new branch establishment. Therefore, it promotes access to financial services for a larger population. These findings are also consistent with those of Shen et al. (2021) and Vu et al. (2023a), who assert that digital finance increases the accessibility of financial institutions and facilitates financial inclusion. In this situation, the availability of financial institutions plays a more significant role in promoting financial inclusion.

The results demonstrated that digital finance significantly moderates the relationship between financial innovation and financial inclusion. These findings are supported by Liu et al. (2021), and Tan et al. (2021), who assert that firms producing financial services adopt digital modes of managing, designing, advertising, and delivering services can innovate their products and services. The resulting financial innovation increases financial accessibility. Therefore, digital finance strengthens the connection between financial innovation and financial inclusion. These findings are also consistent with Arner et al. (2020)'s assertion that digital finance introduces innovation-oriented changes to the management and products of financial institutions, as well as financial innovation that improves their struggle for financial inclusion and grants them success. Therefore, digital finance substantially strengthens the relationship between financial innovation and inclusion. These findings are consistent with Ahmad et al. (2021)'s assertion that digital finance facilitates financial innovation and inclusion. Consequently, the connection between financial innovation and financial inclusion becomes stronger.

6. Implication

As a result of its literary contributions, the study provides researchers with guidance on how to conduct academic duties more effectively. The diversified financial, security, and transactional services provided by the financial sector are essential to a nation's citizens' social and economic well-being. The significance of the current study lies in its applicability to developing economies desiring progress in financial inclusion and, consequently, sustainable country development. This study provides the finance ministry, economists, and government with recommendations for promoting financial inclusion in the nation. The study indicates that policymakers must intend to make financial institutions accessible to the population to promote financial inclusion. The study also recommends that financial institutions incorporate financial innovation to promote financial inclusion. There is also a recommendation that concerned authorities develop promotional strategies for digital finance. It would advance financial inclusion throughout the nation. The study also suggests that to promote financial inclusion. The government must appropriately manage population growth, residence, and economic development. The research guides regulators in developing regulations to enhance financial inclusion through digital finance, financial innovation, and financial institutions. This article suggests that economists and governments should promote financial inclusion by accelerating economic growth. Policymakers are directed to develop digital finance strategies to enhance the role of the availability of financial institutions in financial inclusion. In addition, the study suggests that digital finance should be promoted in the economy, as it would enhance the role of financial innovation in financial inclusion.

7. Conclusion

In a country with a more significant number of financial institutions, they were able to introduce financial services, influence clients, and help them comprehend the procedures. This promotes financial inclusion by making things easier for consumers. In addition, the results indicated that adopting innovation by financial institutions in administering different departments and designing and delivering financial services improves financial services in the respective regions. Therefore, there are advancements in financial inclusion. People are facilitated to benefit from financial products when institutions adopt digital financing, and the public is provided with digital tools such as ATMs, debit cards, credit card-accepting devices, and online websites. It leads to greater financial inclusion. Due to enhanced physical and digital infrastructure development and human capital growth, the results demonstrated that financial services are promoted in densely populated areas, increasing financial inclusion. In addition, the study's findings demonstrated that digital finance moderates the availability of financial institutions, financial innovation, and financial inclusion. The study concluded that more financial institutions could be established if digital finance is adopted and financial inclusion is promoted more effectively.

Similarly, the prevalence of digital finance can encourage financial innovation among financial institutions and users. The adoption of financial innovation advances financial inclusion. Financial inclusion is positively correlated with the availability of financial institutions, financial innovation, digital finance, population development, and economic growth, according to the findings of this study.

8. Limitations

Several restrictions remain associated with this article. However, these limitations are transient and can be eliminated through careful research, allowing for the presentation of a study with more vital implications. To evaluate the progress of financial inclusion in the economy, the research focuses on a limited number of factors, such as the availability of financial institutions, financial innovation, digital finance, population development, and economic growth. Other factors include interest rates, educational campaigns, infrastructure development, etc. However, the authors ignored these significant factors when analyzing financial inclusion. The relationship between additional factors and financial inclusion should be investigated in future studies. For this study, only ASEAN country statistics on the availability of financial institutions, financial innovation, digital finance, population growth, economic development, and financial inclusion were consulted. All economies require financial resources, which depend on the economy's income level and economic conditions. As countries' financial positions and economic conditions vary, data from specific countries cannot be used to derive results pertinent to all nations. Consequently, authors must struggle to organize evidence-based data from countries in various global regions.

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