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RESEARCH ARTICLE

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Unveiling financial inclusion dynamics: Fintech's resonance in Association of Southeast Asian Nations (ASEAN)

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Abstract

This article examines the determinants of financial inclusion in the Association of Southeast Asian Nations (ASEANs), with a particular focus on the role of financial technology (fintech). We constructed an extensive and up-to-date Global Financial Inclusion database (2011, 2014, 2017, and 2021) to generate 26,185 observations for seven ASEAN countries over a decade, and conducted a separate case study for Singapore, the region's most financially developed member. The results reveal that financial inclusion and financial technology have experienced robust growth in ASEAN but to varying degrees amongst the member countries. Fintech has a significant impact on financial inclusion over the specified period. The relationship between age and financial inclusion follows an inverted U-shaped pattern, with the turning point occurring between the ages of 29 and 45. Surprisingly, gender does not appear to be a determining factor. These results align with the aspirations of ASEAN policymakers to promote financial inclusion in line with the sustainable development goals.

KEYWORDS

age threshold, ASEAN, financial inclusion, fintech, global findex, SDGs

1 | INTRODUCTION

Financial inclusion plays a crucial role in reducing poverty and inequality, fostering inclusive growth, and facilitating human development in all countries, but particularly in the developing nations (Adedokun & Ağa, 2021; Allen et al., 2016; Burgess et al., 2005; Churchill & Marisetty, 2020; Demir et al., 2022; Kling et al., 2020; Ofosu-Mensah Ababio et al., 2021; Pradhan et al., 2021). Advancements in financial inclusion also contribute to banking system stability (Ahamed & Mallick, 2019; Danisman & Tarazi, 2020; Hakimi et al., 2021; Wang & Luo, 2021) and expand the access of the unbanked population and small and medium enterprises (SMEs) to financial services (Liu et al., 2021; Lokhande, 2011; Otiato, 2016).

FIGURE 1 The rate of adults who have a bank account worldwide. *Source*: World Development Report (2022). This figure shows the rate of adults having a bank account in ASEAN compared with the rest of the world. This rate is unequal among ASEAN and is relatively smaller compared with Europe and America. [Colour figure can be viewed at wileyonlinelibrary.com]

ASEAN comprises 10 nations: Singapore, Malaysia, Vietnam, Thailand, the Philippines, Indonesia, Brunei, Laos, Myanmar and Cambodia. ASEAN's GDP is expected to exceed US$4 trillion by 2025, with current exports totaling US$1.3 trillion. Projections indicate that ASEAN's exports will reach US$2.8 trillion by 2025, solidifying its position as the world's fastest-growing trade region. In 2020, ASEAN attracted US$70 billion in new investments; its FDI inflow is therefore the largest of the emerging markets. As a single entity, the ASEAN Economic Community ranks as the third-largest economy in Asia and the fifth-largest globally, trailing only the U.S., China, Japan and Germany (HSBC Report, 2021).

According to McKinsey & Company, Southeast Asia is one of the world's fastest-expanding markets, yet it remains relatively underexplored. While ASEAN projects and research aimed at advancing financial inclusion have received support from the World Bank, the Asian Development Bank (Nguyen & Ha, 2021), and other organizations, the region's levels of financial inclusion still lag behind those of other regions. Figure 1 reveals that while financial inclusion is high (>70.04%) in Singapore, Malaysia and Brunei, it falls below 52.27% in the other countries in the region.

ASEAN has recognized that financial exclusion is an issue and it has set a target to reduce its financial exclusion rate to 30% by 2025. The region has also introduced comprehensive plans to, inter alia, strengthen its financial regulations and enhance its financial infrastructure, with a particular focus on promoting financial inclusion through digital platforms (UNCDF, 2023). ASEAN demonstrates unique characteristics, with member countries varying significantly in terms of development level (e.g., Singapore, Malaysia, Cambodia and Laos have financial exclusion rates of 3%, 8%, 71% and 59%, respectively), market size, and the legal and institutional characteristics of their microfinance institutions. Therefore, it is essential to examine the determinants of financial inclusion in ASEAN and its prospects for development. While multiple determinants contribute to financial inclusion, this study places emphasis on the role of fintech, given its primary role in developing countries (Lenka & Barik, 2018; Makina, 2019; Rauniyar et al., 2021; Senyo & Osabutey, 2020).[i]

Despite the extensive body of literature on global financial inclusion, there is a notable gap in research focused on ASEAN (Association of Southeast Asian Nations), particularly in relation to the impact of fintech on financial inclusion. While Morgan (2022) has proposed potential ways in which fintech could contribute to financial inclusion in Southeast Asia and India, it is crucial to note that his study primarily takes the form of a discussion article and lacks empirical evidence. Similarly, Loo (2019) suggests that fintech could enhance financial inclusion in ASEAN, but this research adopts a macro approach, utilizing fintech infrastructure and ecosystems to measure fintech impact. In contrast, we conduct an empirical research to investigate the actual role of fintech in stimulating financial inclusion in this region, utilizing micro-level data.

This study focuses on the ASEAN-8 countries: Indonesia, Malaysia, Laos, the Philippines, Singapore, Thailand, Vietnam and Cambodia. We assess financial

inclusion using three specific critical indicators: having an account with a financial institution, having a debit card, and having a credit card (Demirgüç-Kunt et al., 2020). Fintech is measured by evaluating whether a person uses mobile phones for bill payments, payment transactions or payment transfers.

This study provides three contributions to the existing literature. First, our empirical analysis is enriched by leveraging microdata sourced from the largest and updated Global Financial Inclusion Database (Global Findex), spanning the years 2011, 2014, 2017 and 2021, and encompassing 26,185 observations for the ASEAN-8. This distinctive dataset empowers us to scrutinize the determinants of financial inclusion in ASEAN over a decade, yielding insights into the region's evolving landscape of financial inclusion. Furthermore, the research landscape on financial inclusion and fintech in the region has been notably restricted. Previous studies on financial literacy in Southeast Asia have often relied on more constrained data, both in terms of observation numbers and the studied time frame. This limitation compromises the generalizability of their findings and their capacity to capture enduring trends in financial literacy in the region. We thoroughly examine the financial inclusion characteristics of each member country within the ASEAN-7 region and present a detailed case study on Singapore to illustrate the evolution of financial inclusion and fintech. To the best of our knowledge, this research marks the first attempt to scrutinize the role of fintech as a catalyst for financial inclusion in Southeast Asia with such a comprehensive dataset. Our method of analysing individual countries and making comparisons using long-term data intervals enhances our understanding of the distinctive features of financial inclusion within each specific context.

Second, the study focuses on the role of fintech in financial inclusion. Fintech is a relatively new and rapidly developing field, and its role in financial inclusion in Southeast Asia has not yet been rigorously studied. This research will help fill this gap in current knowledge. This is particularly important for developing countries, where fintech can bridge the gap between the unbanked population and the formal financial system. We introduce an innovative and consistent measure of the 10-year evolution of fintech. We use three questions that are included in every wave of the Global Findex survey, considered as indicators of fintech adoption: (1) using a mobile phone to pay bills in the past 12 months (fit1), (2) using a mobile phone to send money in the past 12 months (fit2) and (3) using a mobile phone to receive money in the past 12 months (fit3). Answering 'yes' to any of these represents the utilization of fintech to access financial services. While our approach mirrors that of Baber (2019) and Demir et al. (2022), our dataset is more comprehensive, and we also explore the interaction of fintech with other social and individual variables. Therefore, we provide deeper insights into fintech adoption and its ultimate impact on financial inclusion.

Third, the empirical analysis captures the effects of individual characteristics, with a particular emphasis on age threshold analysis. Previous research has typically found a linear relationship between age and financial inclusion, with financial inclusion increasing with age. Our findings reveal a U-shaped relationship between age and financial inclusion, with the turning point occurring between the ages of 29 and 45, highlighting the uniqueness of the ASEAN-8 area. While threshold analysis has been conducted to examine the threshold effect of financial inclusion on economic growth (Nizam et al., 2020) or financial inclusion on tax revenues (Raouf, 2022), this is the first study investigating the relationship between financial inclusion and age. Moreover, there is no gender gap in financial inclusion in ASEAN-8, which contrasts with most results in the literature (e.g., Allen et al., 2016; Demirgüç-Kunt, Klapper, & Singer, 2013) and illustrates the effectiveness of women's empowerment in ASEAN. We conducted a systematic literature review on financial inclusion to validate the results, drawing from the Scopus database. Out of the 1211 published studies on financial inclusion, we narrowed our focus to 578 papers published in ABS-ranked or ISI journals. This comprehensive review provides an overview of the current state of financial inclusion research and allows us to identify research gaps and areas requiring further exploration.

The rest of the article is organized as follows: Section 2 summarizes the literature. Section 3 introduces the data and methodology. Section 4 presents and discusses the results, and Section 5 concludes.

2 | LITERATURE REVIEW

2.1 | Theoretical framework

The capacity approach theory, developed by Sen (1980), explains the impact of fintech on development. The theory emphasizes the importance of normative values in guaranteeing technology's accessibility and affordability while also nurturing individual freedom and creativity. The Appropriate Technology Theory, developed by Schumacher amongst others, provides a conceptual framework that explains how we think and act as society develops. The concept of appropriate technology serves as a foundation and methodology for technology selection, which is closely linked to the progress of individuals and thus society development (ICT4D, Pal et al., 2020; Schumacher, 1973). Mobile phones are often viewed as technologies that enhance human freedoms and

capabilities in developing countries (Ahamed & Mallick, 2019; Hatakka & De, 2011). Economic theories related to supply and demand, as well as theoretical models concerning the bundling of products, technology, and services, emphasize fintech's capacity to complement innovations in the financial sector (Dong et al., 2022).

Several theories can be used to explain individual behaviour toward fintech. The Technology Acceptance Model (TAM), developed by Davis (1989), is amongst the most popular theories (for a review, see Senyo & Osabutey, 2020). TAM proposes that two key factors influence the acceptance of technology by its potential users: perceived usefulness and perceived ease of use. The model's central focus is therefore on the user's perceptions. The theory of reasoned action (Bagozzi, 1982; Fishbein, 1980) indicates that end-users rationally assess potential consequences before adopting new technology. This theory can provide insights into why individuals with higher levels of education, greater financial literacy, increased income and urban residency are more inclined to access financial services through fintech. Finally, Ajzen's (1991) theory of planned behaviour shows that an individual's intentions drive fintech usage. Such intentions are shaped by the individual's attitudes, social norms and perceived behavioural control.

The Unified Theory of Acceptance and Usage of Technology, developed by Venkatesh et al. (2003), synthesizes eight theoretical models to provide insights into the adoption and utilization of technology. This model has been extensively applied to explain ICT usage across various domains, including mobile banking (Zhou et al., 2010), mobile payment (Yang et al., 2012), e-government (Wang & Shih, 2009), mobile phone technologies (Zhou, 2011), Internet banking (Riffai et al., 2012) and health information systems (Kijsanayotin et al., 2009).

Regarding financial inclusion and fintech, production theories posit that technology fosters economic growth and development, while institutional theories hold that neoliberalism promotes financial inclusion. The argument is that financial markets progress through institutional transformation and the promotion of market mechanisms. The rise of fintech is regarded as a motivation for enhancing financial markets for people in developing nations who have historically encountered various challenges (Bernards, 2019). This perspective aligns with the policies and pillars for financial inclusion endorsed by the World Bank and the G20.

2.2 | Definition and measurement of financial inclusion

Financial inclusion is variously defined as the use of formal financial services (Allen et al., 2016), an economic condition where individuals and firms can access essential financial services (Amidžic et al., 2014), or a process that ensures the accessibility, availability, and use of financial services by all members of society (Sarma & Pais, 2011). Financial inclusion can be assessed at individual level and at country level. The broadest measure at individual level is account ownership; that is, whether an individual has a bank account (Allen et al., 2016; Demirgüç-Kunt et al., 2017, 2020). Similarly, account ownership is also used as a proxy for financial inclusion at country level, with studies measuring the number of bank accounts per 100 adults (Beck et al., 2007; Honohan, 2008).

Rather than relying on a single measure, some studies have developed an index to measure different dimensions of financial inclusion. For example, Sarma (2008) developed a three-dimension index using banking penetration, availability of banking services, and usage of the banking system. Amidžic et al. (2014) constructed a composite financial inclusion index that incorporates outreach (geographic and demographic penetration), usage (deposit and lending) and quality (disclosure requirement, dispute resolution and cost of usage). The indicator constructed by Park and Mercado (2018) has five measures: automated teller machines (ATMs) per 100,000 adults, commercial bank branches per 100,000 adults, borrowers from commercial banks per 1000 adults, depositors with commercial banks per 1000 adults and the ratio of domestic credit to GDP.

In this study, to comprehensively assess financial inclusion across various dimensions (banking penetration, availability of banking services and usage of the banking system) in ASEAN, we adopt three specific measures of financial inclusion: (1) individuals who have a bank account, (2) individuals who have a debit card and (3) individuals who have a credit card. ASEAN is a region where the availability of financial services is limited, and in which there are significant variations amongst its member countries; therefore, using a single measure may not adequately capture the accessibility aspects of financial inclusion. For example, an individual may possess a credit card but not routinely use it for financial transactions, or they may use their debit card solely for withdrawing their salary or pension. By considering multiple measures, we can ensure a more comprehensive evaluation of individuals' engagement with financial services.

2.3 | Determinants of financial inclusion

The literature on the determinants of financial inclusion is extensive. Empirical studies tend to focus on either individual-level or country-level analysis. At country level, data is generally obtained from the World Bank's

Global Financial Development and Global Findex databases, and the International Monetary Fund's Financial Access Survey. Various factors are found to be enablers of financial inclusion. In particular, Park and Mercado (2015) used data from 37 developing Asian economies from 2004 to 2012 and find that financial inclusion is affected by per capita income, the rule of law, and demographic characteristics. Owen and Pereira (2018) studied 83 countries over 10 years and found that financial inclusion is supported by banking industry concentration and relaxed bank regulation for a broader scope of activities. Le et al. (2019) employed data from 20 Asian countries between 2011 and 2016 and revealed that financial inclusion is positively impacted by economic growth and literacy, and hampered by unemployment rate.

Most studies at individual level use the World Bank Global Findex database (Global Findex). For example, Demirgüç-Kunt, Klapper, and Randall (2013) examined differences in financial inclusion for Muslims and non-Muslims using Global Findex 2011, which covers more than 150,000 individuals in 148 countries. They found that Muslims are less likely to own accounts in Sub-Saharan Africa. Cost, distance and documentation were identified as constraints on account ownership for both Muslims and non-Muslims. In a later study, Demirgüç-Kunt, Klapper, and Singer (2013) demonstrated that gender is another constraint to financial inclusion in 98 developing countries, with women being more likely to experience financial exclusion. Allen et al. (2016) employed Global Findex 2011 in combination with country characteristics to study the determinants of financial inclusion in 123 countries with over 124,000 individuals. They concluded that being poor, female, young and living in rural areas are reasons for financial exclusion.

The effectiveness of policies promoting financial inclusion also depends on individual characteristics. Baber (2019) employed the Global Findex surveys from 2011, 2014 and 2017 to compare the financial inclusion of 10 countries that use either Islamic or conventional finance. The study confirmed that Islamic finance countries are more inclusive and financially empowering than those that rely on conventional finance. Xu (2020) combined Global Findex 2014 with Wave 6 of the World Values Survey to investigate the correlation between social trust and financial inclusion. Trust was found to play a significant role in developing a financial inclusion process. Comparing the levels of financial inclusion around the globe, Wang and Guan (2017) utilized the 2011 Global Findex and showed that developed countries (Europe and North America) express a high level of financial inclusion compared with less developed countries in Africa and Asia. The authors indicated that income, education, and the use of communication equipment are main factors in this.

Many studies on financial inclusion focus on Africa and Asia. For example, Akudugu (2013) used the 2011 Global Findex database to examine the case of Ghana. The results showed that age, education, wealth class, distance to financial institutions, lack of documentation, lack of trust in formal financial institutions, money poverty and social networks are the main reasons for being financially excluded. Soumaré et al. (2016) analysed the case of Central and West Africa and revealed similar results. In particular, gender, education, age, income, residence area, employment status, marital status, household size and the degree of trust in financial institutions are the main reasons for financial exclusion. Zins and Weill (2016) employed the 2014 Global Findex database and showed that gender, income, education and age significantly promote financial inclusion in 37 African countries.

In Asia, too, financial inclusion is a contemporary topic. Fungáčová and Weill (2015) used 2011 Global Findex to examine the features of financial inclusion in China versus the BRICs countries and revealed that the situation is better in China due to its high level of formal accounts and savings. That study also found that income, education, gender and age are the main factors determining financial inclusion in China. These variables maintained their significance in other studies that focus on Asian countries, such as Son et al. (2019) for the case of Vietnam, and Esquivias et al. (2021) for Vietnam, Indonesia and the Philippines.

Some studies have taken a different approach to data generation, using customized surveys to collect individual-level data. For example, Tambunlertchai (2018) used data from 5100 individuals in Myanmar, representing the entire country. The author found that income, education and budget management are determinants of financial inclusion in Myanmar. Amoah et al. (2020) collected primary data from 733 households in Ghana and concluded that mobile money could help promote financial inclusion. Sayed and Shusha (2019) examined the supply side by targeting 470 bank managers in Egypt. They found that banks must diversify their financial products and services to promote financial inclusion. Koomson et al. (2020) and Hasan et al. (2021) used survey data collected in Ghana and Bangladesh respectively to find that financial literacy helps promote financial inclusion.

Although the literature on financial inclusion is extensive, three main gaps motivate us to conduct this research. First, few studies examine the impacts of fintech on financial inclusion in ASEAN. The region's impressive economic growth and development prospects require more comprehensive research, especially on an issue as crucial as financial inclusion. This study investigates the significant role of fintech in accelerating the

achievement of ASEAN's goals ahead of the scheduled reduction of the financial exclusion rate to 30% by 2025.

Second, this research makes the first attempt to incorporate data from the four Global Findex surveys conducted in 2011, 2014, 2017 and 2021 to examine changes in fintech and financial inclusion. Moreover, we draw on all four surveys to provide a comprehensive picture of the impacts of fintech on financial inclusion, using the 2011 database as the base case. As such, we extend the work of Baber (2019), which used data from Global Findex 2011, 2014 and 2017 (2011 being the base case) to focus on fintech and financial inclusion in 10 countries that used either Islamic or conventional financing methods. However, there was relatively small variation in terms of financial inclusion within Baber's sample. Our study provides a more comprehensive overview of financial inclusion in ASEAN over a 10-year period, highlighting the key drivers that shape its dynamics. It therefore offers valuable insights to policymakers within the region. As well as demonstrating the role of fintech in boosting financial inclusion, our research sheds light on an essential aspect that previous studies have overlooked: the nonlinear effect of age on financial inclusion. By identifying the thresholds that delineate the impact of age on financial inclusion in the ASEAN region, our study offers valuable insights into this previously unexplored dimension.

Finally, we introduce into our models variables that interact fintech with other factors, namely age, barriers to accessing financial services (distance, cost, lack of documentation and lack of trust), and country. We can thus assess disparities in the impacts of fintech on financial inclusion. These interactive terms illustrate how fintech interacts with individual characteristics and country-specific conditions to promote financial inclusion in various jurisdictions.

3 | DATA AND METHODOLOGY

3.1 | Data

This study utilizes the Global Findex database, which contains survey data that is collected every 3 years (2011, 2014, 2017 and 2021). The last survey was to have been released in 2020 but was delayed by a year due to the global impact of the COVID-19 pandemic. As a result, the latest dataset for country-level analysis became available in June 2022, while the latest dataset for individual-level analysis was released in October 2022. The individual-level dataset includes data from 123 economies worldwide, with a robust sample size of 1000 individuals for each country, providing a comprehensive and up-to-date understanding of financial inclusion on a global scale.

Our intent was to analyse data from 10 ASEAN countries in this study. Unfortunately, Global Findex does not have data for Brunei or fintech data for Myanmar; therefore, these two countries are excluded from the analysis. We chose Cambodia as the baseline country for our model because it has the lowest level of financial inclusion. Data from the four surveys (2011, 2014, 2017 and 2021) are aggregated to examine the changes and trends in the impact of fintech on financial inclusion during the period. The final dataset includes 26,185 observations for seven countries: Cambodia, Indonesia, Laos, Malaysia, Philippines, Thailand and Vietnam. Singapore is more advanced and developed than the other countries in the region; hence, rather than including this outlier in the aggregated data, we compared it with Cambodia in a separate case study.

Due to inconsistent data on financial inclusion and fintech across different years and countries, we carefully screened the variables based on the measurement scale for each year and country. Only the variables related to financial inclusion, fintech and constraints (related to financial inclusion) are retained, and 'unknown' and 'undecided' responses are excluded; this allows us to gain reliable insights into the characteristics of each variable. While the survey included questions about mobile money, those questions were only available for a few countries and were inconsistently applied across the years. Therefore, this research does not use mobile money as a measure of fintech. Instead, our fintech variable is constructed from three questions that were available and consistent across all four survey years: [Has the respondent] 'used a mobile phone to pay bills in the past 12 months', 'used a mobile phone to send money in the past 12 months' and/or 'used a mobile phone to receive money in the past 12 months'. Given the absence of data for Brunei and Myanmar, our analysis is centred on the ASEAN-7 countries, with a separate case study for Singapore.

3.2 | Empirical models

Logit regression models are applied to examine the determinants of financial inclusion:

$$\begin{aligned}\text{Logit}(\text{P}(Y=1|x_1,...,x_k)) = {} & \beta_0+\beta_1\text{fit}_{ijt}+\beta_2\text{lack}_{ijt}\\ & +\beta_3 X_{ijt}+\beta_4\text{fit}_{ijt}.\\ & X_{ijt}.\end{aligned}$$

where Y denotes financial inclusion measured by reference to three questions from Global Findex: (1) whether the respondent has a bank account; (2) whether the respondent has a debit card; (3) whether the respondent

TABLE 1 Description of variables.

Variables	Abbreviation	Description	Literature	Expected sign
Dependent variables				
Financial inclusion	fin	One of the three following cases: (1) Has a bank account; (2) Has a debit card; (3) Has a credit card	Zins and Weill (2016); Allen et al. (2016); Demirgüç-Kunt et al. (2017); Demirgüç-Kunt et al. (2020)	
Fintech	fit1	Has used a mobile phone to pay bills in the past 12 months	Asongu and Odhiambo (2018); Asongu and Nwachukwu (2018); Demir et al. (2022)	+
	fit2	Has used a mobile phone to send money in the past 12 months	Demirguc-Kunt et al. (2018); Asongu and Nwachukwu (2018); Asongu and Odhiambo (2018); Philippon (2019)	+
	fit3	And Has used a mobile phone to receive money in the past 12 months.	Demirguc-Kunt et al. (2018); Asongu and Nwachukwu (2018); Asongu and Odhiambo (2018); Philippon (2019)	+
	fit	Equal 1 if one of fit1, fit2, and fit 3 is 1.	Baber (2019); Wang and Guan (2017); Amoah et al. (2020)	
Reason for not having an account	Lack	Equal 1 if having one of the following reasons for not having an account: too far away, too expensive, lack documentation, or lack trust.	Akudugu (2013); Demirgüç-Kunt, Klapper, and Randall (2013); Soumaré et al. (2016); Xu (2020)	−
Fintech and lack	int1	=fit*lack	Not used up to now	+
Fintech and age	int2	=fit*age	Not used up to now	+
Fintech and Philippines	int3	=fit*Philip	Not used up to now	−
Fintech and Laos	int4	=fit*Laos	Not used up to now	+
Control variables				
Age	Age	Age of the interviewee	Akudugu (2013); Soumaré et al. (2016); Zins and Weill (2016); Son et al. (2019); Esquivias et al. (2020)	+
Age-square	age2	Age-square	Akudugu (2013); Zins and Weill (2016)	−
Gender	gender	Equal 1 if the gender of the interviewee is male and 0 otherwise	Akudugu (2013); Demirgüç-Kunt, Klapper, and Singer (2013); Fungáčová and Weill (2015); Allen et al. (2016); Soumaré et al. (2016); Zins and Weill (2016); Son et al. (2019); Esquivias et al. (2020)	+
Education	edu_i	Dummy education with three levels: completed primary or less, completed tertiary or more, secondary	Akudugu (2013); Fungáčová and Weill (2015); Soumaré et al. (2016); Zins and Weill (2016); Wang and Guan (2017); Tambunlertchai (2018); Le et al. (2019); Son et al. (2019); Esquivias et al. (2020); Nawaz (2022)	+
Income	$inco_i$	Dummy, two income groups (rich and poor)	Akudugu (2013); Park and Mercado (2015); Fungáčová and Weill (2015); Allen et al. (2016); Soumaré et al. (2016); Zins and Weill (2016);	+

(Continues)

TABLE 1 (Continued)

Variables	Abbreviation	Description	Literature	Expected sign
			Wang and Guan (2017); Tambunlertchai (2018); Son et al. (2019); Esquivias et al. (2020)	
Country	$ctry_i$	Dummy, i is from 1 to 7, standing for Cambodia, Indonesia, Laos, Malaysia, Philippines, Thailand and Vietnam, respectively; Cambodia is the base case	Fungáčová and Weill (2015); Wang and Guan (2017)	
Year	$year_i$	Dummy, i from 1 to 3, representing 2011, 2014, 2017 and 2021, respectively		

Note: This Table describes the variables included in the model, supported by the literature and expected signs.

has a credit card. *Y* represents an individual's ability to access any one of the three services.

'Fit' represents fintech, measured by three questions that are consistent across the four survey waves: (1) whether the individual has used a mobile phone to pay bills in the past 12 months (fit1); (2) whether the individual has used a mobile phone to send money in the past 12 months (fit2); (3) whether the individual has used a mobile phone to receive money in the past 12 months (fit3). All these questions indicate the ability to use payment technology. Therefore, similar to financial inclusion, this variable has a value of 1 if an individual answers 'yes' to one of the three questions, and 0 otherwise.

The Lack variable represents the reasons an individual cannot access financial services. The Global Findex database suggests six such reasons, however, we use the four that are most relevant to survey participants in this region: (1) too far away, (2) too expensive, (3) lack of documentation and (4) lack of trust. Lack has a value of 1 if an individual answers 'yes' to one of the four questions, and 0 otherwise.

X represents participants' demographic characteristics; that is, age, gender, education and income.

The definition, measurement and expected effect of all variables are presented in Table 1.

4 | RESULTS AND DISCUSSION

4.1 | Financial inclusion and fintech in ASEAN—An overview

Figure 2 indicates that the degree of financial inclusion has increased in ASEAN during the investigated period (except for Singapore, which has slightly declined but has still maintained its highest ranking in ASEAN). The differences between the countries are significant. For example, in 2021 the levels of financial inclusion for Cambodia, Laos and Myanmar were 28.53%, 40.9% and 50.3% respectively, whereas for Thailand, Singapore and Malaysia, the figures were 97.32%, 97% and 91.49%.

Financial inclusion significantly increased across the four survey periods in ASEAN, with extremely high levels in Malaysia (71.3%, 84.50%, 87.25% and 91.49%), Singapore (98.7%, 96.0%, 97.9% and 97%) and Thailand (73.8%, 78.90%, 82.2% and 97.32%); there were also slow increases in Cambodia, Vietnam and the Philippines (see Figure 2). The growth of fintech exhibits distinct patterns amongst different countries. For instance, the Philippines led in fintech adoption in 2011 with a rate of 14.2%, but by 2017, it ranked second to last at 9.1%, just above Indonesia. One plausible explanation is the World Bank's alteration of the fintech measure in 2017 to include mobile money accounts, which were not widely used in the Philippines during this period, accounting for only 0.13% (BSP, 2017). In contrast, Singapore and Malaysia experienced remarkable fintech growth in 2014, 2017 and 2021. Singapore's high-income status and its sixteenth global ranking in financial development (IMF, 2022) make this outcome expected, as confirmed by regression comparing Singapore with Cambodia (see Appendix I). Malaysia stands out as another success story in ASEAN, where financial inclusion has been legislatively mandated as a primary function of the Bank Negara Malaysia (Malaysia Central Bank) since 2009. The country also introduced the Financial Inclusion Framework in 2011 (BNM, 2021; Table 2).

The differences in the development of financial inclusion and fintech in ASEAN countries are driven by national government policies that promote these parameters. Table 3 shows that countries with an early plan to

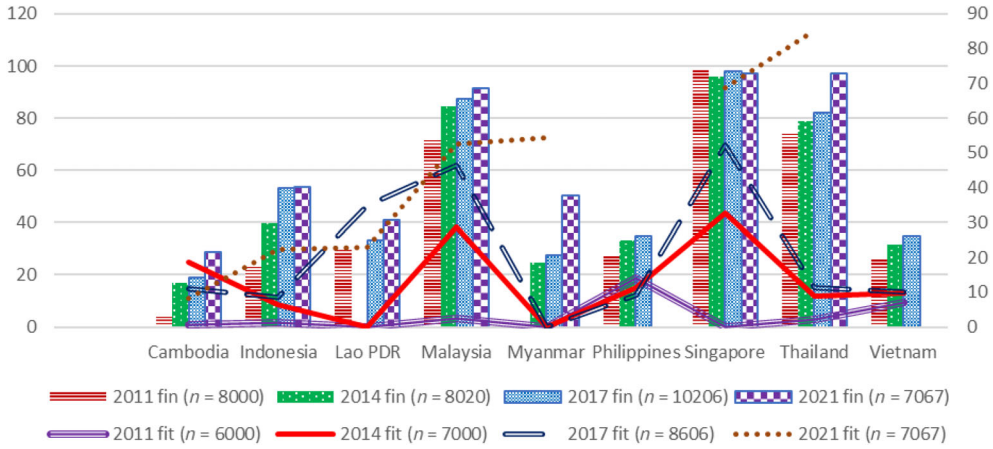

FIGURE 2 Financial inclusion and fintech in ASEAN. *Source*: Global Findex database 2011, 2014, 2017 and 2021. This figure exhibits the level of fintech and financial inclusion in ASEAN. Besides Malaysia and Singapore where financial inclusion and fintech are relatively more advanced, Thailand has a high level of financial inclusion. [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Fintech in ASEAN.

	2011		2014		2017		2021	
	fit ($n = 6000$)		fit ($n = 7000$)		fit ($n = 8606$)		fit ($n = 7067$)	
Country	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Cambodia	5	0.50	186	18.60	176	11	81	8.11
Indonesia	11	1.10	65	6.50	86	8.6	236	22.22
Lao PDR	na	na	na	na	na	34.8	228	22.8
Malaysia	25	2.50	288	28.80	467	46.51	526	52.65
Myanmar	na	na	na	na	na	na	544	54.4
Philippines	142	14.20	113	11.30	91	9.1	na	na
Singapore	na	na	328	32.80	523	52.3	686	68.6
Thailand	20	2.00	89	8.90	112	11.2	859	85.3
Vietnam	69	6.90	98	9.80	101	10.08	na	na
Total	272	4.53	1167	16.67	1904	22.12	3160	44.71

Note: This table indicates the level of fintech adoption in ASEAN, which is growing over time.
Source: Global Findex database 2011, 2014, 2017 and 2021.

prioritize the development of financial inclusion, as reflected in a national financial inclusion strategy or financial sector development strategy (Malaysia, Indonesia), have a high financial inclusion index. However, where countries find it necessary to improve their technological innovation during the development process, especially when innovations are related to financial technology and mobile money (the websites of the national Central Banks provide information on such matters), financial inclusion progress is slower. Moreover, the discrete approaches adopted by individual ASEAN nations to address the issue of financial inclusion on a national scale are lamentable, as a more concerted and coordinated effort would likely yield enhanced outcomes. The lack of homogeneity in their initiatives is evident in the consolidated reports from diverse countries (Table 3), revealing discrepancies in terms of unit, structure and content.

4.2 | Descriptive statistics of the dataset

Table 4 presents the comprehensive dataset statistics in Panel A and the demographic characteristics of respondents in Panel B. The dataset comprises a total of 33,804 observations, which are evenly distributed across Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam (9%–13% each). The observations are also evenly spread across the survey waves, with each wave accounting for approximately 23%–29% of the data.

Financial inclusion and fintech are dummy variables with average values of 0.514 and 0.251, respectively. Financial inclusion's constraints are measured by the lack variable, which takes the value of 1 if respondents faced distance, cost, documentation or trust hurdles. The average value of lack in this dataset is 0.271. Respondent age ranges from 15 to 96, with an average age of 40.72.

TABLE 3 Financial inclusion policy in ASEAN.

Country	National financial inclusion strategy (NFIS)	Financial sector development strategy (FSDS)
Cambodia	2019–2025	2016–2025
Indonesia	2016	Quick response code Indonesia standard
Laos	na	Plan for strengthening financial education 2018–2025
Malaysia	2011: Financial inclusion framework	Know-Your-Customer (e-KYC), 2020
Myanmar	2018: Financial inclusion framework/2019	The 2019–2023 Myanmar financial inclusion roadmap, 2020
Philippines	2015	
Thailand	2017–2021	Financial Sector Master Plan Phase III (2016–2020)
Vietnam	2020–2025	2012

Note: This table reports the national financial inclusion strategy and the financial sector development strategy of eight ASEAN countries.
Source: Compiled from UNCDF (2023).

The dataset maintains a balanced gender distribution, with 57.03% being female and 43% male. Regarding education, 43.12% completed primary school or less, 21.67% attained a secondary school education and 34.37% achieved tertiary education or higher. Income is a dummy variable which equals 1 if the respondent is rich (43.98%) and 0 if poor (56.02%).

4.3 | Financial inclusion and financial technology in ASEAN

The results in Table 5 show a positive effect of fintech on financial inclusion across all fintech measures. Lack has the strongest effect on financial inclusion, but the most significant impact is observed in fit of model 1, which is the overall fintech index. This is followed by fit1 (using mobile phones to pay bills: model 2), then fit3 (using mobile phones for transfer payments: model 4) and lastly, fit2 (using mobile phones for payment transactions: model 3). These findings align with existing literature that underscores the pivotal role of fintech in promoting financial inclusion (Fernandes et al., 2021; Gosavi, 2018; Senyo et al., 2021; Tchamyou et al., 2019). Notably, Demir et al. (2022) posit that fintech contributes to a reduction in income inequality through enhanced financial inclusion. Mobile technology emerges as a key tool in mitigating financial exclusion, particularly in regions where access to formal financial services is limited, yet mobile phone penetration is widespread. The promotion of digital financial inclusion is integral to both the UN 2030 Agenda for Sustainable Development (UN-2030-ASD) and the G20 High-Level Principles for Digital Financial Inclusion (G20-HLP-DFI). A 2022 report by the World Economic Forum highlights the active engagement of a digital generation in ASEAN, utilizing mobile applications to access financial services. Notably, digital payment apps, including e-banking and e-wallets, rival the popularity of social media apps within this demographic.

Examining Cambodia as the baseline, the discernible impact of fintech on financial inclusion is most pronounced in Malaysia, Thailand, Indonesia and the Philippines. Notably, these impacts show a notable escalation over time, with a significant increase in 2021 compared with preceding periods in 2017, 2014 and 2011. Key transformations are particularly evident in fit1 (utilizing a mobile phone for bill payments), fit3 (employing a mobile phone for receiving money) and fit2 (utilizing a mobile phone for sending money), each demonstrating impact factors of 0.137, 0.133 and 0.104, respectively. This expansion can be attributed to the surge in mobile penetration and the evolution of digital banking across the ASEAN region during the study period. A 2015 survey by McKinsey suggests a growing sophistication amongst ASEAN consumers and an increasing receptiveness to digital banking.

Contrastingly, the impact of fintech on financial inclusion in Vietnam, Laos and Indonesia appears significantly lower than that in Cambodia for the years 2014, 2017 and 2021, despite these three countries exhibiting higher levels of financial inclusion. This outcome suggests a noteworthy alteration in financial inclusion dynamics in Cambodia (Asian Development Bank, 2019). Fintech, as evidenced by its impact, has played a transformative role by reducing costs and enhancing the accessibility of financial services, thereby catering to individuals with lower incomes (National Bank of Cambodia, 2018; World Bank, 2020). Chea (2021) underscores the substantial growth of the fintech landscape in Cambodia, particularly in digital payments and transfers. The catalytic role of the COVID-19 pandemic in promoting cashless transactions is noteworthy. Furthermore, the proactive promotion and support for innovation by the National Bank of Cambodia (NBC) have been instrumental in improving the accessibility and affordability of digital financial services while advancing financial inclusion and interoperability.

Financial inclusion is also affected by individual demographic characteristics. In particular, the effect of age on financial inclusion is U-shaped, with a threshold

TABLE 4 Descriptive statistics of the participants.

A: Overall descriptive statistics					
Variable	**Obs**	**Mean**	**Std. dev.**	**Min**	**Max**
fin	33,804	0.514	0.500	0	1
fit	30,184	0.251	0.434	0	1
fit1	21,832	0.110	0.313	0	1
fit2	17,147	0.194	0.396	0	1
fit3	29,049	0.207	0.405	0	1
lack	33,804	0.271	0.444	0	1
age	33,804	40.722	16.174	15	96
gen	33,804	0.430	0.495	0	1
edu1	33,804	0.431	0.495	0	1
edu2	33,804	0.217	0.412	0	1
edu3	33,804	0.344	0.475	0	1
inc	33,804	0.440	0.496	0	1
Cambodia	33,804	0.136	0.343	0	1
Indonesia	33,804	0.120	0.325	0	1
Laos	33,804	0.089	0.284	0	1
Malaysia	33,804	0.105	0.306	0	1
Myanmar	33,804	0.107	0.309	0	1
Philippines	33,804	0.118	0.323	0	1
Singapore	33,804	0.118	0.323	0	1
Thailand	33,804	0.119	0.323	0	1
Vietnam	25,739	0.116	0.320	0	1
2011	33,804	0.235	0.424	0	1
2014	33,804	0.237	0.425	0	1
2017	33,804	0.290	0.454	0	1
2021	33,804	0.239	0.426	0	1

B: Individual characteristics of respondents in each country								
		gen (%)		**edu (%)**			**inc (%)**	
Economy	**Age**	**Female**	**Male**	**Primary or less**	**Secondary**	**Tertiary or more**	**Rich**	**Poor**
Cambodia	40.23	64.27	36	87.17	2.94	8.65	41.51	58.49
Indonesia	39.08	56.29	44	34.82	19.86	45.27	44.5	55.5
Lao PDR	38.36	59	41	54.33	16.1	29.47	42.57	57.43
Malaysia	38.17	50	50	15.41	41.53	40.69	44.07	55.93
Myanmar	39.10	58.95	41	58.65	17.76	23.56	45.08	54.92
Philippines	38.62	53.53	46	25.64	24.14	50.2	46.1	53.9
Singapore	45.07	53.64	46	20.98	38.18	40.16	40.86	59.14
Thailand	44.93	61.09	39	48.74	12.55	38.28	46.82	53.18
Vietnam	42.41	54.65	45	34.81	26.51	35.58	44.58	55.42
Total	40.72	57.03	43	43.12	21.67	34.37	43.98	56.02

Note: This table presents the descriptive statistics of the database in Panel A and provides details on the individual characteristics of the participants in each country in Panel B.

TABLE 5 The determinants of financial inclusion (logit model).

	Compare (2014, 2017 and 2021) to 2011, (2017 and 2021) to 2014 and 2021 to 2017											
	(1)			(2)			(3)			(4)		
Variables	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017
fit	0.183***	0.209***	0.212***	0.137***	0.238***	0.240***	0.104***	0.132***	0.0641***	0.133***	0.176***	0.178***
	(0.006)	(0.007)	(0.008)	(0.012)	(0.025)	(0.025)	(0.012)	(0.016)	(0.014)	(0.007)	(0.010)	(0.011)
lack	−0.418***	−0.388***	−0.374***	−0.448***	−0.415***	−0.382***	−0.484***	−0.423***	−0.312***	−0.437***	−0.408***	−0.386***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.010)	(0.009)	(0.009)	(0.006)	(0.006)	(0.006)
age	0.008***	0.008***	0.007***	0.005***	0.002**	0.002	0.007***	0.005***	0.001	0.008***	0.008***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
age2	−9.48e-05***	−9.17e-05***	−8.00e-05***	−6.90e-05***	−4.01e-05***	−3.07e-05**	−7.96e-05***	−6.24e-05***	0.000	−9.64e-05***	−9.28e-05***	−8.37e-05***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gen	−0.006	−0.007	−0.011*	0.002	0.005	−0.001	−0.003	−0.003	−0.011	−0.005	−0.006	−0.010
	(0.004)	(0.005)	(0.006)	(0.005)	(0.007)	(0.008)	(0.006)	(0.007)	(0.010)	(0.005)	(0.005)	(0.006)
edu2	0.144***	0.119***	0.107***	0.158***	0.121***	0.122***	0.166***	0.115***	0.0907***	0.156***	0.132***	0.127***
	(0.007)	(0.008)	(0.009)	(0.008)	(0.009)	(0.011)	(0.009)	(0.011)	(0.015)	(0.007)	(0.008)	(0.009)
edu3	0.105***	0.105***	0.104***	0.107***	0.109***	0.110***	0.104***	0.0999***	0.0711***	0.110***	0.113***	0.112***
	(0.005)	(0.007)	(0.008)	(0.006)	(0.008)	(0.010)	(0.007)	(0.010)	(0.013)	(0.006)	(0.007)	(0.008)
inc	0.061***	0.052***	0.041***	0.070***	0.061***	0.048***	0.073***	0.068***	0.040***	0.065**	0.057***	0.046***
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)	(0.010)	(0.004)	(0.005)	(0.006)
Indo	−0.123***	−0.0963***	−0.111***	−0.159***	−0.112***	−0.104***	−0.228***	−0.168***	−0.181***	−0.143***	−0.104***	−0.108***
	(0.009)	(0.011)	(0.012)	(0.012)	(0.015)	(0.016)	(0.014)	(0.023)	(0.026)	(0.011)	(0.012)	(0.013)
Laos	−0.157***	−0.136***	−0.144***	−0.133***	−0.101***	−0.093***	−0.135***	−0.090***	−0.113***	−0.116***	−0.085***	−0.089***
	(0.010)	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.018)	(0.028)	(0.024)	(0.010)	(0.012)	(0.012)
Malaysia	0.243***	0.226***	0.172***	0.277***	0.288***	0.273***	0.253***	0.250***	0.101***	0.252***	0.236***	0.188***
	(0.009)	(0.011)	(0.014)	(0.011)	(0.014)	(0.019)	(0.011)	(0.014)	(0.026)	(0.009)	(0.011)	(0.014)
Philippines	0.004	0.002	−0.005	0.021**	0.021	0.012	−0.007	−0.003	−0.060***	0.014	0.010	0.000
	(0.009)	(0.010)	(0.012)	(0.011)	(0.013)	(0.015)	(0.012)	(0.015)	(0.020)	(0.009)	(0.011)	(0.013)
Thailand	0.246***	0.219***	0.203***	0.259***	0.227***	0.224***	0.235***	0.195***	0.0745***	0.252***	0.225***	0.209***
	(0.009)	(0.010)	(0.013)	(0.010)	(0.012)	(0.015)	(0.011)	(0.013)	(0.021)	(0.009)	(0.010)	(0.013)

TABLE 5 (Continued)

	Compare (2014, 2017 and 2021) to 2011, (2017 and 2021) to 2014 and 2021 to 2017											
	(1)			(2)			(3)			(4)		
Variables	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017
Vietnam	−0.118***	−0.135***	−0.137***	−0.130***	−0.162***	−0.167***	−0.123***	−0.134***	−0.166***	−0.123***	−0.147***	−0.158***
	(0.009)	(0.011)	(0.014)	(0.011)	(0.013)	(0.017)	(0.012)	(0.016)	(0.028)	(0.009)	(0.011)	(0.014)
2014	0.076***			0.092***			0.063***			0.072***		
	(0.006)			(0.008)			(0.007)			(0.007)		
2017	0.124***	0.035***		0.178***	0.062***		0.231***	0.136***		0.141***	0.049***	
	(0.006)	(0.006)		(0.007)	(0.008)		(0.009)	(0.010)		(0.006)	(0.007)	
2021	0.194***	0.102***	0.069***	0.252***	0.128***	0.063***	0.277***	0.177***	0.0427***	0.204***	0.105***	0.054***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.010)	(0.009)	(0.010)	(0.012)	(0.011)	(0.007)	(0.008)	(0.007)
Observations	26,185	19,245	13,253	19,673	12,868	9218	15,244	8439	3447	25,050	18,245	13,253

Note: This table reports the determinants of financial inclusion using the logit model. In the (1), (2), (3), and (4) models, fintech is measured by fit, fit1, fit2, and fit3, respectively. The analysis is conducted for three scenarios, 2021, 2017 and 2014–2011; 2021 and 2017–2014 and 2021–2017. The marginal effects of independent variables obtained from the Logit model are presented in the results.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; standard error in the brackets.

Source: Global Findex database 2011, 2014, 2017 and 2021.

Model	2021, 2017 and 2014–2011	2021 and 2017–2014	2021–2017
fit	44.789	44.598	45.229
fit1	40.832	32.727	31.751
fit2	44.314	41.034	29.749
fit3	45.056	45.731	45.506

TABLE 6 Age threshold in the models.

Note: This table shows the age threshold in the periods of 2014, 2017 and 2021 compared with 2011; 2017 and 2021–2014 and 2021–2017.
Source: Calculate from Global Findex database 2011, 2014, 2017 and 2021.

of 29.75–45.73 in 2021, 2017 and 2014–2011; 2021 and 2017–2014 and 2021–2017 (the threshold is calculated based on the method introduced by Lind & Mehlum, 2010).

The age threshold for accessing bill payments (fit1) and transfers (fit2) is gradually decreasing, which aligns with the rapid digital transformation in ASEAN countries. The age threshold for receiving wages shows an increase, which again is consistent with the trend of ageing population, the raising of the retirement age and the payment of pensions via bank accounts (fit 3) (Table 6).[ii]

Education and income both exert a positive impact on financial inclusion. Accordingly, the level of financial inclusion is higher for individuals with higher education and income. This is likely because education increases people's knowledge of financial services, and people with higher incomes have more disposable income to save and invest.

Financial exclusion could be explained by the lack variables, which indicate that people may live too far away from banking facilities, find the cost of them to be too high, are missing necessary documentation, or lack trust.

Interestingly, our study reveals that the accessibility to financial services is equivalent for males and females in the ASEAN region. This outcome challenges the prevailing conclusions of numerous prior studies (e.g., Ghosh & Vinod, 2017; Lotto, 2020) that have consistently highlighted the disproportionate financial exclusion of women attributed to factors, such as education and wage discrimination. The apparent absence of such gender-based differentials in financial access within the ASEAN context contradicts prevailing narratives. Notably, ASEAN is portrayed as a commendable exemplar of gender equality, a recognition corroborated by reports from UNDP (2021), The ASEAN (2021) and references in UNCDF (2023).

Table 7 presents the effects of interaction variables on financial inclusion in ASEAN. The findings indicate that fintech positively influences financial inclusion, benefiting older individuals and those facing distance, cost, documentation or distrust constraints.

Over the examined period, Laos, Indonesia and Vietnam consistently display lower levels of financial inclusion compared with Cambodia, even when accounting for the impact of fintech. This unexpected finding implies a potential inadequacy in technological infrastructure and insufficient investment in fintech within these countries, posing challenges to the widespread adoption of such technologies. Loo (2019) underscores the escalating importance of innovative banking distribution models in Cambodia, including outsourced or non-branch-based services. In contrast, state financial institutions play a pivotal role in propelling financial inclusion in Vietnam and Laos. The extensive involvement of state institutions implies that non-state entities require support to effectively collaborate with the state in addressing the complexities associated with financial inclusion. For example, Circular No. 01/2022/TT-NHNN regulating the Governor of the State Bank of Vietnam to consider approving or disapproving the establishment and termination of operations of commercial banks.

Regarding delivering services through mobile platforms, Cambodia and Laos exhibit the highest potential for such services exerting a substantial impact. In Indonesia, the country's archipelagic nature and sociocultural diversity have created limitations for financial institutions. While fintech has been introduced to promote financial inclusion, many consumers still need help understanding and accessing these new services (ADB report, 2022).

We observe that older individuals in ASEAN countries who utilize fintech can experience improved access to financial services. This is likely due to the user-friendly and accessible design of fintech products and services tailored to older adults. For instance, many fintech apps incorporate voice-activation and simplified user interfaces that are easier for older adults to navigate. Fintech also plays a crucial role in facilitating financial access for individuals facing constraints. For example, individuals who live far from banks or financial institutions can leverage fintech for making payments or money transfers, or to access loans. Additionally, fintech helps alleviate the cost burden associated with accessing financial

TABLE 7 The determinants of financial inclusion considering interaction variables.

	(1)			(2)		
Variables	**2021, 2017 and 2014–2011**	**2021 and 2017–2014**	**2021–2017**	**2021, 2017 and 2014–2011**	**2021 and 2017–2014**	**2021–2017**
fit*age	0.00130***	0.00119**	0.000	0.00118*	(0.001)	0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
fit*Laos	0.0871***	0.230***	0.234***	−0.117***	(0.046)	(0.053)
	(0.016)	(0.022)	(0.022)	(0.031)	(0.080)	(0.078)
fit*Philippines	−0.0974***	−0.0543***	−0.0340*	−0.032	−0.074	−0.079
	(0.017)	(0.018)	(0.020)	(0.046)	(0.054)	(0.054)
fit	0.128***	0.130***	0.136***	0.174***	0.301***	0.258***
	(0.017)	(0.021)	(0.024)	(0.036)	(0.079)	(0.078)
lack	−0.412***	−0.378***	−0.362***	−0.447***	−0.415***	−0.382***
	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)	(0.007)
age	0.00828***	0.00802***	0.00726***	0.00545***	0.00267**	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
age2	−9.25e-05***	−8.96e-05***	−8.03e-05***	−6.67e-05***	−4.08e-05***	−3.05e-05**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gen	(0.006)	(0.006)	−0.00990*	0.001	0.005	(0.001)
	(0.004)	(0.005)	(0.006)	(0.005)	(0.007)	(0.008)
edu2	0.141***	0.116***	0.105***	0.159***	0.121***	0.122***
	(0.007)	(0.007)	(0.009)	(0.008)	(0.009)	(0.011)
edu3	0.102***	0.104***	0.102***	0.108***	0.109***	0.110***
	(0.005)	(0.007)	(0.008)	(0.007)	(0.008)	(0.010)
inc	0.0631***	0.0533***	0.0419***	0.0695***	0.0617***	0.0485***
	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)	(0.007)
Indo	−0.123***	−0.0939***	−0.108***	−0.155***	−0.112***	−0.104***
	(0.009)	(0.011)	(0.012)	(0.012)	(0.015)	(0.016)
Laos	−0.208***	−0.206***	−0.213***	−0.112***	−0.100***	−0.0922***
	(0.011)	(0.013)	(0.014)	(0.014)	(0.015)	(0.015)
Malaysia	0.245***	0.230***	0.178***	0.275***	0.288***	0.273***
	(0.009)	(0.011)	(0.014)	(0.011)	(0.014)	(0.019)
Philippines	0.0248***	0.0190*	0.013	0.0202*	0.0240*	0.016
	(0.009)	(0.011)	(0.013)	(0.011)	(0.013)	(0.016)
Thailand	0.250***	0.225***	0.211***	0.259***	0.228***	0.224***
	(0.009)	(0.010)	(0.013)	(0.010)	(0.012)	(0.015)
Vietnam	−0.111***	−0.128***	−0.129***	−0.131***	−0.161***	−0.165***
	(0.009)	(0.011)		(0.011)	(0.013)	(0.017)
2014	0.0812***			0.0898***		
	(0.006)			(0.008)		
2017	0.130***	0.0316***		0.172***	0.0620***	
	(0.006)	(0.006)		(0.007)	(0.008)	
2021	0.212***	0.112***	0.0824***	0.243***	0.129***	0.0639***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.010)	(0.009)

(Continues)

TABLE 7 (Continued)

Variables	(1) 2021, 2017 and 2014–2011	(1) 2021 and 2017–2014	(1) 2021–2017	(2) 2021, 2017 and 2014–2011	(2) 2021 and 2017–2014	(2) 2021–2017
Observations	26,185	19,245	13,253	19,673	12,868	9218

Note: This table reports the determinants of financial inclusion using the logit model considering interaction variables. In the (1) and (2) models, fintech is measured by fit and fit1, respectively. The analysis is conducted for three scenarios, 2021, 2017 and 2014–2011; 2021 and 2017–2014; and 2021–2017. The marginal effects of independent variables obtained from the Logit model are presented in the results.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; standard error in the brackets.

Source: Global Findex database 2011, 2014, 2017 and 2021.

services. Given that access is also hindered by a lack of necessary documentation and low levels of trust in traditional financial institutions, our findings underscore the significant role of fintech as a catalyst for reducing financial exclusion within ASEAN. Fintech serves as a bridge, closing the gap between those who can access financial services and those who cannot. By enhancing the accessibility, affordability and user-friendliness of financial services, fintech can enhance the financial well-being of individuals and communities across the region.

4.4 | Diagnostic test and robustness test

The abovementioned results are robust, as evidenced by multiple diagnostic tests for multicollinearity and heteroskedasticity. No close linear relationship amongst the variables is found in the model, even with age and age-squared (Gujarati, 1995). Also, heteroskedasticity is unlikely to appear in a logit model since the dependent variable is binary (Davidson & MacKinnon, 1984). The chi-square likelihood ratio test on the model's fitness and ability to omit variables shows that the model is likely to fit.

We re-ran the ASEAN-7 models for 2011, 2014, 2017 and 2021 as separate years; the results are consistent with the aggregated data regressions. Financial inclusion measured separately by fin1 (used a mobile phone to pay bills), fin2 (used a mobile phone to send money) and fin3 (used a mobile phone to receive money) also produce consistent results. The interaction of fintech and other explanatory variables were added to the model sequentially, and the results are consistent for the different models.

5 | CONCLUSION AND POLICY RECOMMENDATIONS

We conclude with a discussion of how fintech offers opportunities for impactful research on fintech and the promise of building a financially inclusive society in ASEAN. This study examines the evolving impact of fintech on financial inclusion in ASEAN countries throughout the period 2011–2021. The findings underscore a progressive increase in the effects of fintech on financial inclusion, demonstrating a positive and statistically significant influence, with notable implications observed in Malaysia, Thailand, Indonesia and the Philippines. These effects are discernible across various fintech measures, aligning with existing literature that underscores the pivotal role of fintech in stimulating financial inclusion, mitigating income inequality and supporting digital financial inclusion initiatives (e.g., the UN 2030 Agenda for Sustainable Development and the G20 High-Level Principles for Digital Financial Inclusion).

This study provides a comprehensive understanding of financial inclusion and the role of fintech in the rapidly evolving ASEAN region. By uncovering the intricacies of financial exclusion through a sophisticated database and examining the associated relationships, the study offers valuable insights for the region to enhance financial access. This, in turn, contributes to improvements in economic growth, income inequality, and human development. The commendable achievements of ASEAN in fostering financial inclusion, particularly in countries like Cambodia, and addressing gender disparities, are noteworthy. These findings carry significant policy implications for ASEAN nations.

At the country level, to advance financial inclusion and align with the goals of the ASEAN 2025 Blueprint, governments are urged to prioritize three key dimensions: expedited adoption of fintech, fostering collaborative initiatives amongst countries, and dedicated support for fintech development, with a specific emphasis on start-ups and SMEs. By integrating these recommendations into policymaking, governments can harness the full potential of fintech to mitigate financial exclusion across ASEAN, tailored to demographic nuances and the specific needs of diverse populations, thereby advancing the overarching financial inclusion objectives of the ASEAN Economic Community. ASEAN countries should

enhance collaborations and learn from each other in their policies to stimulate financial inclusion. Particularly, Central Banks in ASEAN should unify statistical data according to form, measure and content within the existing cooperation framework, to properly assess the current state of financial inclusion and find common solutions for the region, especially solutions related to fintech.

At the individual level, data in the past 10 years reveals that the development of fintech has been a driving force for financial inclusion in ASEAN. Fintech has propelled Cambodia forward and has distinguished Singapore from other countries. Therefore, managers and financial service organizations need to design products and services that align with different pathways appropriate for the characteristics of each country, taking into account people's diverse social and economic backgrounds. Financial inclusion exhibits a sophisticated interdependence with age, characterised by a U-shaped pattern with a threshold identified at 29.75–45.73. Both education and income exert a positive influence on financial inclusion. Contrary to prevailing research, this study reveals gender parity in financial inclusion amongst males and females in ASEAN, challenging the conventional narrative of gender-based financial exclusion rooted in educational and wage disparities. Moreover, the results underscore the positive impact of fintech on financial inclusion, particularly benefiting older individuals and those grappling with challenges related to distance, cost, documentation or trust issues.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

[i] It must be noted that while smartphones are widely used elsewhere in the world to improve access to financial products, this is not the case in ASEAN (Andrianaivo & Kpodar, 2012).

[ii] The analysis on the impact of fintech and constraints on financial inclusion by age threshold is provided in Appendix II.

REFERENCES

ADB Report. (2022). Indonesia—Expanding financial inclusion through digital innovations. https://www.adb.org/multimedia/partnership-report2022/stories/expanding-financial-inclusion-through-digital-innovations/#:~:text=Many%20factors%20contribute%20to%20a,them%2C%20much%20less%20access%20them

Adedokun, M. W., & Ağa, M. (2021). Financial inclusion: A pathway to economic growth in sub-Saharan African economies. *International Journal of Finance & Economics*, *28*, 2712–2728. https://doi.org/10.1002/ijfe.2559

Ahamed, M. M., & Mallick, S. K. (2019). Is financial inclusion good for bank stability? International evidence. *Journal of Economic Behavior & Organization*, *157*, 403–427. https://doi.org/10.1016/j.jebo.2017.07.027

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Akudugu, M. A. (2013). The determinants of financial inclusion in Western Africa: Insights from Ghana. *Research Journal of Finance and Accounting*, *4*(8), 1–9.

Allen, F., Demirguc-Kunt, A., Klapper, L., & Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation*, *27*, 1–30. https://doi.org/10.1016/j.jfi.2015.12.003

Amidžic, G., Massara, M. A., & Mialou, A. (2014). Assessing countries' financial inclusion standing—A new composite index. In *IMF working paper, no. 14/36*. International Monetary Fund. https://doi.org/10.2139/ssrn.2407529

Amoah, A., Korle, K., & Asiama, R. K. (2020). Mobile money as a financial inclusion instrument: What are the determinants? *International Journal of Social Economics*, *47*(10), 1283–1297. https://doi.org/10.1108/IJSE-05-2020-0271

Andrianaivo, M., & Kpodar, K. (2012). Mobile phones, financial inclusion, and growth. *Review of Economics and Institutions*, *3*(2), 30. https://doi.org/10.5202/rei.v3i2.75

Asian Development Bank. (2019). *Fintech for financial inclusion: Cambodia country report*. Asian Development Bank.

Asongu, S. A., & Nwachukwu, J. C. (2018). Educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in sub-Saharan Africa. *Technological Forecasting and Social Change*, *129*, 164–172. https://doi.org/10.1016/j.techfore.2018.01.004

Asongu, S. A., & Odhiambo, N. M. (2018). ICT, financial access and gender inclusion in the formal economic sector: Evidence from Africa. *African Finance Journal*, *20*(2), 45–65. https://doi.org/10.2139/ssrn.3305000

Baber, H. (2019). Financial inclusion and FinTech: A comparative study of countries following Islamic finance and conventional finance. *Qualitative Research in Financial Markets*, *12*(1), 24–42. https://doi.org/10.1108/QRFM-12-2018-0131

Bagozzi, R. P. (1982). A field investigation of causal relations among cognitions, affect, intentions, and behavior. *Journal of Marketing Research*, *19*(4), 562–584. https://doi.org/10.1177/002224378201900415

Beck, T., Demirguc-Kunt, A., & Peria, M. S. M. (2007). Reaching out: Access to and use of banking services across countries. *Journal of Financial Economics*, *85*(1), 234–266. https://doi.org/10.1016/j.jfineco.2006.07.002

Bernards, N. (2019). Tracing mutations of neoliberal development governance: 'Fintech', failure and the politics of marketization. *Environment and Planning A: Economy and Space*, *51*(7), 1442–1459. https://doi.org/10.1177/0308518X19862576

BNM. (2021). Malaysia's financial inclusion framework. https://www.bnm.gov.my/documents/20124/1073866/Malaysia's+Financial+Inclusion+Framework.pdf

BSP. (2017). Financial inclusion survey 2017—Moving towards digital financial inclusion. https://www.bsp.gov.ph/Inclusive%20Finance/Financial%20Inclusion%20Reports%20and%20Publications/2017/2017FISToplineReport.pdf

Burgess, R., Pande, R., & Wong, G. (2005). Banking for the poor: Evidence from India. *Journal of the European Economic Association*, *3*(2–3), 268–278. https://doi.org/10.1162/jeea.2005.3.2-3.268

Chea. (2021). Promoting fintech development to achieve financial inclusion in Cambodia. https://amro-asia.org/promoting-fintech-development-to-achieve-financial-inclusion-in-cambodia/

Churchill, S. A., & Marisetty, V. B. (2020). Financial inclusion and poverty: A tale of forty-five thousand households. *Applied Economics*, *52*(16), 1777–1788. https://doi.org/10.1080/00036846.2019.1678732

Danisman, G. O., & Tarazi, A. (2020). Financial inclusion and bank stability: Evidence from Europe. *The European Journal of Finance*, *26*(18), 1842–1855. https://doi.org/10.1080/1351847X.2020.1782958

Davidson, R., & MacKinnon, J. G. (1984). Convenient specification tests for logit and probit models. *Journal of Econometrics*, *25*(3), 241–262. https://doi.org/10.1016/0304-4076(84)90001-0

Davis, F. D. (1989). Technology acceptance model: TAM. In A. S. Al-Aufi (Ed.), *Al-Suqri, MN* (pp. 205–219). Information Seeking Behavior and Technology Adoption.

Demir, A., Pesqué-Cela, V., Altunbas, Y., & Murinde, V. (2022). Fintech, financial inclusion and income inequality: A quantile regression approach. *The European Journal of Finance*, *28*(1), 86–107. https://doi.org/10.1080/1351847X.2020.1772335

Demirgüç-Kunt, A., Klapper, L., & Singer, D. (2017). Financial inclusion and inclusive growth: A review of recent empirical evidence. In *Policy Research Working Paper Series 8040*. The World Bank. https://doi.org/10.1596/1813-9450-8205

Demirguc-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2018). *The global findex database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Publications. https://doi.org/10.1596/978-1-4648-1259-0

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The global findex database 2017: Measuring financial inclusion and opportunities to expand access to and use of financial services. *The World Bank Economic Review*, *34*(Supplement_1), S2–S8. https://doi.org/10.1093/wber/lhz013

Demirgüç-Kunt, A., Klapper, L. F., & Randall, D. (2013). Islamic finance and financial inclusion: Measuring use of and demand for formal financial services among Muslim adults. In *World Bank Policy Research Working Paper, 6642*. The World Bank. https://doi.org/10.1596/1813-9450-6642

Demirgüç-Kunt, A., Klapper, L. F., & Singer, D. (2013). Financial inclusion and legal discrimination against women: Evidence from developing countries. *World Bank Policy Research Working Paper, 6416*. The World Bank. https://doi.org/10.1596/1813-9450-6416

Dong, J., Dou, Y., Jiang, Q., & Zhao, J. (2022). Can financial inclusion facilitate carbon neutrality in China? The role of energy efficiency. *Energy*, *251*, 123922. https://doi.org/10.1016/j.energy.2022.123922

Esquivias, M. A., Sethi, N., Ramandha, M. D., & Jayanti, A. D. (2021). Financial inclusion dynamics in Southeast Asia: An empirical investigation on three countries. *Business Strategy & Development*, *4*(2), 203–215. https://doi.org/10.1002/bsd2.139

Esquivias, M. A., Sugiharti, L., Jayanti, A. D., Purwono, R., & Sethi, N. (2020). Mobile technologies, financial inclusion and inclusive growth in East Indonesia. *Journal of Telecommunications and the Digital Economy*, *8*(2), 123–145. https://doi.org/10.18080/jtde.v8n2.253

Fernandes, C., Borges, M. R., & Caiado, J. (2021). The contribution of digital financial services to financial inclusion in Mozambique: An ARDL model approach. *Applied Economics*, *53*(3), 400–409. https://doi.org/10.1080/00036846.2020.1808177

Fishbein, M. (1980). A theory of reasoned action: Some applications and implications. In H. E. Howe (Ed.), *1979 Nebraska symposium on motivation*. University of Nebraska Press.

Fungáčová, Z., & Weill, L. (2015). Understanding financial inclusion in China. *China Economic Review*, *34*, 196–206. https://doi.org/10.1016/j.chieco.2014.12.004

Ghosh, S., & Vinod, D. (2017). What constrains financial inclusion for women? Evidence from Indian micro data. *World Development*, *92*, 60–81. https://doi.org/10.1016/j.worlddev.2016.11.011

Gosavi, A. (2018). Can mobile money help firms mitigate the problem of access to finance in eastern sub-Saharan Africa? *Journal of African Business*, *19*(3), 343–360. https://doi.org/10.1080/15228916.2017.1396791

Gujarati, D. N. (1995). *Basic econometrics* (4th ed.). United States Military Academy.

Hakimi, A., Boussaada, R., & Karmani, M. (2021). Are financial inclusion and bank stability friends or enemies? Evidence from MENA banks. *Applied Economics*, *1–17*, 2473–2489. https://doi.org/10.1080/00036846.2021.1992342

Hasan, M., Le, T., & Hoque, A. (2021). How does financial literacy impact on inclusive finance? *Financial Innovation*, *7*(1), 1–23. https://doi.org/10.1186/s40854-021-00259-9

Hatakka, M., & De, R. (2011). Development, capabilities and technology: an evaluative framework. Proceedings of the 11th

International Conference on Social Implications of Computers in Developing Countries, Kathmandu, Nepal, May 2011.

Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance*, *32*(11), 2493–2500. https://doi.org/10.1016/j.jbankfin.2008.05.004 https://www.gsma.com/mobilemoneymetrics/#regulatory-index?y=2020

HSBC Report. (2021). Opening up a world of opportunity. https://www.business.hsbc.com/en-gb/campaigns/asean

IMF. (2022). Financial development index database. https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b&sId=1481207801912

Kijsanayotin, B., Pannarunothai, S., & Speedie, S. M. (2009). Factors influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model. *International Journal of Medical Informatics*, *78*(6), 404–416. https://doi.org/10.1016/j.ijmedinf.2008.12.005

Kling, G., Pesqué-Cela, V., Tian, L., & Luo, D. (2020). A theory of financial inclusion and income inequality. *The European Journal of Finance*, *1–21*, 137–157. https://doi.org/10.1080/1351847X.2020.1792960

Koomson, I., Villano, R. A., & Hadley, D. (2020). Intensifying financial inclusion through the provision of financial literacy training: A gendered perspective. *Applied Economics*, *52*(4), 375–387. https://doi.org/10.1080/00036846.2019.1645943

Le, T. T., Dang, N. D. L., Nguyen, T. D. T., Vu, T. S., & Tran, M. D. (2019). Determinants of financial inclusion: Comparative study of Asian countries. *Asian Economic and Financial Review*, *9*(10), 1107–1123. https://doi.org/10.18488/journal.aefr.2019.910.1107.1123

Lenka, S. K., & Barik, R. (2018). Has expansion of mobile phone and internet use spurred financial inclusion in the SAARC countries? *Financial Innovation*, *4*(1), 1–19. https://doi.org/10.1186/s40854-018-0089-x

Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U-shaped relationship. *Oxford Bulletin of Economics and Statistics*, *72*(1), 109–118. https://doi.org/10.1111/j.1468-0084.2009.00569.x

Liu, Y., Luan, L., Wu, W., Zhang, Z., & Hsu, Y. (2021). Can digital financial inclusion promote China's economic growth? *International Review of Financial Analysis*, *78*, 101889. https://doi.org/10.1016/j.irfa.2021.101889

Lokhande, M. A. (2011). Financial inclusion: Options for micro, small and medium enterprises. *Synergy*, *9*(2), 39–51.

Loo, M. K. L. (2019). Enhancing financial inclusion in ASEAN: Identifying the best growth markets for fintech. *Journal of Risk and Financial Management*, *12*(4), 181. https://doi.org/10.3390/jrfm12040181

Lotto, J. (2020). Understanding financial inclusion in East Africa: How does Tanzania compare? *International Journal of Finance & Economics*, *27*, 1075–1084. https://doi.org/10.1002/ijfe.2201

Makina, D. (2019). The potential of FinTech in enabling financial inclusion. In *Extending financial inclusion in Africa* (pp. 299–318). Academic Press. https://doi.org/10.1016/B978-0-12-814164-9.00014-1

Morgan, P. J. (2022). Fintech and financial inclusion in Southeast Asia and India. *Asian Economic Policy Review*, *17*(2), 183–208. https://doi.org/10.1111/aepr.12379

National Bank of Cambodia. (2018). *Financial inclusion in Cambodia: Progress and challenges*. National Bank of Cambodia.

Nawaz, T. (2022). What's in an education? Implications of CEO education for financial inclusion. *International Journal of Finance & Economics*, *27*(3), 3741–3753. https://doi.org/10.1002/ijfe.2348

Nguyen, Y. H. D., & Ha, D. T. T. (2021). The effect of institutional quality on financial inclusion in ASEAN countries. *The Journal of Asian Finance, Economics and Business*, *8*(8), 421–431. https://doi.org/10.13106/jafeb.2021.vol8.no8.0421

Nizam, R., Karim, Z. A., Rahman, A. A., & Sarmidi, T. (2020). Financial inclusiveness and economic growth: New evidence using a threshold regression analysis. *Economic Research*, *33*(1), 1465–1484. https://doi.org/10.1080/1331677X.2020.1748508

Ofosu-Mensah Ababio, J., Attah-Botchwey, E., Osei-Assibey, E., & Barnor, C. (2021). Financial inclusion and human development in frontier countries. *International Journal of Finance & Economics*, *26*(1), 42–59. https://doi.org/10.1002/ijfe.1775

Otiato, E. H. (2016). Determinants of financial inclusion and performance of small and medium enterprises in Nairobi city county. *International Journal of Finance and Accounting*, *1*(3), 62–78. https://doi.org/10.47604/ijfa.203

Owen, A. L., & Pereira, J. M. (2018). Bank concentration, competition, and financial inclusion. *Review of Development Finance*, *8*(1), 1–17. https://doi.org/10.1016/j.rdf.2018.05.001

Pal, A., De', R., & Herath, T. (2020). The role of mobile payment technology in sustainable and human-centric development: Evidence from the post-demonetization period in India. *Information Systems Frontiers*, *22*, 607–631. https://doi.org/10.1007/s10796-020-09982-7

Park, C. Y., & Mercado Jr, R. (2018). Financial inclusion, poverty, and income inequality. *The Singapore Economic Review*, *63*(1), 185–206.

Philippon, T. (2019). On fintech and financial inclusion. In *Working paper 26330*. National Bureau of Economic Research. https://doi.org/10.3386/w26330

Pradhan, R. P., Arvin, M. B., Nair, M. S., Hall, J. H., & Bennett, S. E. (2021). Sustainable economic development in India: The dynamics between financial inclusion, ICT development, and economic growth. *Technological Forecasting and Social Change*, *169*, 120758. https://doi.org/10.1016/j.techfore.2021.120758

Raouf, E. (2022). The impact of financial inclusion on tax revenue in EMEA countries: A threshold regression approach. *Borsa Istanbul Review*, *22*(6), 1158–1164. https://doi.org/10.1016/j.bir.2022.08.003

Rauniyar, K., Rauniyar, K., & Sah, D. K. (2021). Role of fintech and innovations for improvising digital financial inclusion. *International Journal of Innovative Science and Research Technology*, *6*, 1419–1424.

Riffai, M. M. M. A., Grant, K., & Edgar, D. (2012). Big TAM in Oman: Exploring the promise of on-line banking, its adoption by customers and the challenges of banking in Oman. *International Journal of Information Management*, *32*(3), 239–250. https://doi.org/10.1016/j.ijinfomgt.2011.11.007

Sarma, M. (2008). Index of financial inclusion. In *Working Paper, No. 215, Indian Council for Research on International Economic Relations (ICRIER)*.

Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, *23*(5), 613–628. https://doi.org/10.1002/jid.1698

Sayed, M. N., & Shusha, A. (2019). Determinants of financial inclusion in Egypt. *Asian Economic and Financial Review*, *9*(12), 1383–1404. https://doi.org/10.18488/journal.aefr.2019.912.1383.1404

Schumacher, E. F. (1973). *Small is beautiful*. Harper & Row.

Sen, A. (1980). Description as choice. *Oxford Economic Papers*, *32*(3), 353–369. https://doi.org/10.1093/oxfordjournals.oep.a041484

Senyo, P. K., Karanasios, S., Gozman, D., & Baba, M. (2021). FinTech ecosystem practices shaping financial inclusion: The case of mobile money in Ghana. *European Journal of Information Systems*, *1–16*, 112–127. https://doi.org/10.1080/0960085X.2021.1978342

Senyo, P. K., & Osabutey, E. L. (2020). Unearthing antecedents to financial inclusion through FinTech innovations. *Technovation*, *98*, 102155. https://doi.org/10.1016/j.technovation.2020.102155

Son, T. H., Liem, N. T., Ly, H. T. N., & Son, T. H. (2019). Understanding financial inclusion in Vietnam. *Research in World Economy*, *10*(3), 382–390. https://doi.org/10.5430/rwe.v10n3p382

Soumaré, I., Tchana Tchana, F., & Kengne, T. M. (2016). Analysis of the determinants of financial inclusion in central and West Africa. *Transnational Corporations Review*, *8*(4), 231–249. https://doi.org/10.1080/19186444.2016.1265763

Tambunlertchai, K. (2018). Determinants and barriers to financial inclusion in Myanmar: What determines access to financial services and what hinders it? *The Singapore Economic Review*, *63*(1), 9–26. https://doi.org/10.1142/S0217590818410011

Tchamyou, V. S., Erreygers, G., & Cassimon, D. (2019). Inequality, ICT and financial access in Africa. *Technological Forecasting and Social Change*, *139*, 169–184. https://doi.org/10.1016/j.techfore.2018.11.004

The ASEAN. (2021). Gender equality—Bridge to progress. https://asean.org/wp-content/uploads/2021/08/The-ASEAN-April-May-2021-Issue.pdf

UNCDF. (2023). 2022 ASEAN monitoring progress: Financial inclusion in selected ASEAN countries. https://www.uncdf.org/article/8202/2022-monitoring-progress-financial-inclusion-in-asean

UNDP. (2021). Gender inequality index (GII). https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. https://doi.org/10.2307/30036540

Wang, R., & Luo, H. (2021). How does financial inclusion affect bank stability in emerging economies? *Emerging Markets Review*, *51*, 100876. https://doi.org/10.1016/j.ememar.2021.100876

Wang, X., & Guan, J. (2017). Financial inclusion: Measurement, spatial effects and influencing factors. *Applied Economics*, *49*(18), 1751–1762. https://doi.org/10.1080/00036846.2016.1226488

Wang, Y. S., & Shih, Y. W. (2009). Why do people use information kiosks? A validation of the unified theory of acceptance and use of technology. *Government Information Quarterly*, *26*(1), 158–165. https://doi.org/10.1016/j.giq.2008.07.001

World Bank. (2020). *Financial inclusion in Cambodia: Opportunities and challenges*. World Bank.

World Development Report. (2022). ASEAN digital generation report: Digital financial inclusion. https://www3.weforum.org/docs/WEF_ASEAN_Digital_Generation_Report_2022.pdf

Xu, X. (2020). Trust and financial inclusion: A cross-country study. *Finance Research Letters*, *35*, 101310. https://doi.org/10.1016/j.frl.2019.101310

Yang, S., Lu, Y., Gupta, S., Cao, Y., & Zhang, R. (2012). Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits. *Computers in Human Behavior*, *28*(1), 129–142. https://doi.org/10.1016/j.chb.2011.08.019

Zhou, T. (2011). An empirical examination of initial trust in mobile banking. *Internet Research*, *21*(5), 527–540. https://doi.org/10.1108/10662241111176353

Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*(4), 760–767. https://doi.org/10.1016/j.chb.2010.01.013

Zins, A., & Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of Development Finance*, *6*(1), 46–57. https://doi.org/10.1016/j.rdf.2016.05.001

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APPENDIX I: The impact of fintech on financial inclusion (logit model) in Singapore compared with Cambodia.

This table reports the determinants of financial inclusion using the logit model. In the (1), (2), (3) and (4) models, fintech is measured by fit, fit1, fit2 and fit3, respectively. The analysis is conducted for two scenarios, 2021 and 2017–2014 and 2021–2017. The marginal effects of independent variables obtained from the Logit model are presented in the results.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; standard error in the brackets.

Source: Global Findex database 2011, 2014, 2017 and 2021.

	(1)		(2)		(3)		(4)	
Variables	**2021 and 2017–2014**	**2021–2017**	**2021 and 2017–2014**	**2021–2017**	**2021 and 2017–2014**	**2021–2017**	**2021 and 2017–2014**	**2021–2017**
fit	0.147***	0.155***	0.203***	0.235***	0.078***	0.081***	0.191***	0.209***
	(0.011)	(0.014)	(0.043)	(0.050)	(0.018)	(0.026)	(0.015)	(0.017)
lack	−0.328***	−0.295***	−0.250***	−0.287***	−0.228***	−0.286***	−0.266***	−0.290***
	(0.008)	(0.011)	(0.011)	(0.013)	(0.015)	(0.020)	(0.010)	(0.011)
age	0.002*	−0.001	0.001	0.000	0.001	−0.005	0.001	0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
age2	0.000	3.72e-05**	0.000	0.000	0.000	6.55e-05*	2.11e-05*	3.47e-05**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gen	0.005	−0.002	0.003	0.002	(0.005)	(0.015)	(0.001)	(0.003)
	(0.008)	(0.010)	(0.011)	(0.013)	(0.011)	(0.019)	(0.009)	(0.010)
edu2	0.290***	0.275***	0.314***	0.369***	0.137***	0.275***	0.199***	0.257***
	(0.013)	(0.019)	(0.023)	(0.027)	(0.015)	(0.029)	(0.014)	(0.019)
edu3	0.242***	0.325***	0.318***	0.375***	0.189***	0.307***	0.266***	0.313***
	(0.011)	(0.016)	(0.018)	(0.021)	(0.019)	(0.028)	(0.014)	(0.016)
inc	0.005	0.019*	0.018	0.020	−0.002	0.005	0.014	0.019**
	(0.008)	(0.010)	(0.011)	(0.013)	(0.011)	(0.018)	(0.009)	(0.010)
2014								
2017	−0.032***		−0.306***		−0.140***		−0.219***	
	(0.010)		(0.030)		(0.020)		(0.018)	
2021	0.0322***	0.077***	−0.246***	0.063***	−0.085***	0.052***	−0.147***	0.070***
	(0.011)	(0.010)	(0.030)	(0.013)	(0.018)	(0.019)	(0.017)	(0.010)
Observations	6598	4598	3540	3001	2145	1145	5598	4598

APPENDIX II: The impact of fintech and constraints on financial inclusion by age threshold (AT).

This table reports the determinants of financial inclusion using the logit model. The analysis is conducted for three scenarios, 2021, 2017 and 2014–2011; 2021 and 2017–2014 and 2021–2017. The marginal effects of independent variables obtained from the Logit model are presented in the results.

A: Fintech with different measures (fit)						
	AT <44.789	AT >44.789	AT <44.598	AT >44.598	AT <45.276	AT >45.276
Variables	2021, 2017 and 2014–2011		2021 and 2017–2014		2021–2017	
fit*age	0.000	0.0034***	0.000	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
fit*Laos	0.123***	0.036	0.235***	0.228***	0.234***	0.233***
	(0.020)	(0.029)	(0.025)	(0.040)	(0.025)	(0.041)
fit*Philippines	−0.072***	−0.141***	−0.042**	−0.058	−0.031	−0.026
	(0.019)	(0.036)	(0.020)	(0.040)	(0.023)	(0.048)
fit	0.149***	0.024	0.160***	0.127	0.159***	0.111
	(0.026)	(0.069)	(0.032)	(0.101)	(0.035)	(0.119)
lack	−0.401***	−0.416***	−0.369***	−0.379***	−0.356***	−0.360***
	(0.007)	(0.010)	(0.006)	(0.010)	(0.007)	(0.011)
age	0.0267***	(0.002)	0.0221***	0.000	0.0155***	0.004
	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.006)
age2	0.000***	0.000	0.000***	0.000	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gen	−0.015***	0.014**	−0.017***	0.019**	−0.021***	0.016*
	(0.005)	(0.007)	(0.006)	(0.008)	(0.007)	(0.010)
edu2	0.131***	0.140***	0.109***	0.119***	0.0984***	0.106***
	(0.008)	(0.012)	(0.009)	(0.013)	(0.011)	(0.017)
edu3	0.099***	0.102***	0.109***	0.090***	0.101***	0.102***
	(0.007)	(0.009)	(0.008)	(0.011)	(0.010)	(0.015)
inc	0.062***	0.061***	0.050***	0.053***	0.040***	0.040***
	(0.005)	(0.007)	(0.006)	(0.008)	(0.007)	(0.010)
Indo	−0.128***	−0.115***	−0.094***	−0.089***	−0.102***	−0.120***
	(0.012)	(0.016)	(0.014)	(0.018)	(0.015)	(0.022)
Laos	−0.231***	−0.175***	−0.220***	−0.185***	−0.222***	−0.198***
	(0.014)	(0.018)	(0.017)	(0.020)	(0.017)	(0.024)
Malaysia	0.239***	0.267***	0.222***	0.251***	0.168***	0.202***
	(0.011)	(0.016)	(0.013)	(0.020)	(0.016)	(0.026)
Philippines	−0.002	0.079***	−0.006	0.072***	−0.001	0.051**
	(0.011)	(0.017)	(0.013)	(0.019)	(0.015)	(0.025)
Thailand	0.234***	0.282***	0.193***	0.266***	0.175***	0.250***
	(0.012)	(0.014)	(0.014)	(0.016)	(0.017)	(0.021)

A: Fintech with different measures (fit)						
	AT <44.789	AT >44.789	AT <44.598	AT >44.598	AT <45.276	AT >45.276
Variables	2021, 2017 and 2014–2011		2021 and 2017–2014		2021–2017	
Vietnam	−0.072***	−0.160***	−0.079***	−0.194***	−0.076***	−0.227***
	(0.011)	(0.015)	(0.013)	(0.017)	(0.016)	(0.025)
2014	0.090***	0.069***				
	(0.008)	(0.010)				
2017	0.133***	0.123***	0.024***	0.038***		
	(0.007)	(0.009)	(0.008)	(0.009)		
2021	0.223***	0.203***	0.117***	0.110***	0.090***	0.074***
	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)
Observations	16,259	9926	11,994	7251	8657	4596
B: Fintech with different measures (fit1)						
	AT <40.832	AT >40.832	AT <32.727	AT >32.727	AT <31.751	AT >31.751
Variables	2021, 2017 and 2014–2011		2021 and 2017–2014		2021–2017	
fit*age	0.004**	0.003**	0.005	−0.002	0.003	−0.001
	(0.002)	(0.002)	(0.007)	(0.004)	(0.008)	(0.004)
fit*Laos	−0.108***	−0.104**	−0.039	−0.076	−0.012	−0.095
	(0.040)	(0.051)	(0.133)	(0.097)	(0.128)	(0.097)
fit*Philippines	−0.030	−0.036	−0.171**	0.007	−0.174**	0.005
	(0.056)	(0.082)	(0.084)	(0.082)	(0.081)	(0.081)
fit	0.117**	0.000	0.210	0.318*	0.230	0.297*
	(0.057)	(0.096)	(0.173)	(0.177)	(0.177)	(0.175)
lack	−0.434***	−0.448***	−0.406***	−0.411***	−0.385***	−0.374***
	(0.009)	(0.011)	(0.011)	(0.009)	(0.011)	(0.009)
age	0.028***	−0.004	0.037***	0.000	0.039**	−0.001
	(0.004)	(0.004)	(0.013)	(0.003)	(0.016)	(0.003)
age2	0.000***	0.000	0.000***	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
gen	−0.009	0.014*	−0.020*	0.016**	−0.020	0.008
	(0.007)	(0.008)	(0.012)	(0.008)	(0.014)	(0.009)
edu2	0.149***	0.151***	0.110***	0.118***	0.115***	0.115***
	(0.011)	(0.012)	(0.017)	(0.012)	(0.020)	(0.014)
edu3	0.105***	0.108***	0.115***	0.107***	0.098***	0.112***
	(0.009)	(0.009)	(0.017)	(0.010)	(0.020)	(0.012)
inc	0.072***	0.065***	0.069***	0.056***	0.047***	0.048***
	(0.007)	(0.008)	(0.011)	(0.008)	(0.014)	(0.009)
Indo	−0.142***	−0.170***	−0.084***	−0.124***	−0.073***	−0.118***
	(0.016)	(0.018)	(0.027)	(0.019)	(0.028)	(0.019)
Laos	−0.116***	−0.111***	−0.101***	−0.101***	−0.087***	−0.095***
	(0.018)	(0.020)	(0.025)	(0.018)	(0.026)	(0.018)
Malaysia	0.262***	0.300***	0.277***	0.300***	0.270***	0.277***
	(0.014)	(0.017)	(0.023)	(0.018)	(0.033)	(0.023)

(Continues)

B: Fintech with different measures (fit1)						
	AT <40.832	AT >40.832	AT <32.727	AT >32.727	AT <31.751	AT >31.751
Variables	2021, 2017 and 2014–2011		2021 and 2017–2014		2021–2017	
Philippines	−0.009	0.060***	0.005	0.037**	0.025	0.014
	(0.015)	(0.018)	(0.022)	(0.017)	(0.026)	(0.020)
Thailand	0.249***	0.275***	0.189***	0.238***	0.178***	0.231***
	(0.014)	(0.014)	(0.024)	(0.014)	(0.034)	(0.017)
Vietnam	−0.080***	−0.179***	(0.034)	−0.215***	−0.021	−0.224***
	(0.014)	(0.016)	(0.023)	(0.016)	(0.030)	(0.021)
2014	0.107***	0.070***				
	(0.011)	(0.011)				
2017	0.180***	0.158***	0.075***	0.056***		
	(0.010)	(0.010)	(0.015)	(0.009)		
2021	0.257***	0.229***	0.159***	0.121***	0.069***	0.064***
	(0.011)	(0.012)	(0.017)	(0.011)	(0.016)	(0.010)
Observations	10,234	9439	3980	8888	2722	6496