

ACI Research Paper #20-2023

## **Pandemic-catalyzed Digital Financial Inclusion: Evidence from the ASEAN Payment System**

Ammu GEORGE

Taojun XIE

September 2023

Please cite this article as:

George, Ammu and Taojun Xie, "Pandemic-catalyzed digital financial inclusion: Evidence from the ASEAN payment system", Research Paper #20-2023, *Asia Competitiveness Institute Research Paper Series (September 2023)*.

# Pandemic-catalyzed digital financial inclusion: Evidence from the ASEAN payment system\*

Ammu George<sup>a</sup>, Taojun Xie<sup>a,\*</sup>

<sup>a</sup>*Asia Competitiveness Institute, Lee Kuan Yew School of Public Policy, National University of Singapore, 469C Bukit Timah Road, Singapore, 259772, Singapore*

---

## Abstract

The COVID-19 pandemic has expedited the shift towards digital payment systems. This study examines the progression of digital financial inclusion in the Association of Southeast Asian Nations (ASEAN) - a region known for its advanced digital financial platforms - using data from the 2017 and 2021 Global Findex Database surveys. Our findings indicate that ASEAN's adoption of digital account ownership, particularly mobile money, outpaced other regions, attributed to its pre-existing digital initiatives and infrastructure. We observed a notable decline in cash transactions, supplanted by digital payments during the pandemic. Among the less economically advanced ASEAN nations, the primary barriers to financial institution account ownership were insufficient funds and perceived lack of necessity for such services. Furthermore, our analysis reveals that ASEAN's shift to digital payments was more rapid than in other regions, with women in ASEAN transitioning to online payments at a faster rate than their male counterparts.

**Keywords:** pandemic, digital payment, gender, financial inclusion, ASEAN

**JEL codes:** J16, O32, B54

---

---

\*We thank colleagues at the Asia Competitiveness Institute for constructive comments.

\*Corresponding author.

*Email addresses:* sppammu@nus.edu.sg (Ammu George), tjxie@nus.edu.sg (Taojun Xie)

## 1. Introduction

The COVID-19 pandemic profoundly affected the global economy, particularly the financial sector. A significant shift during this period was the rapid embrace of digital financial services. As lockdowns and social distancing became the norm, online shopping surged, and face-to-face transactions dwindled, leading to a preference for digital payments over cash. Additionally, concerns about the virus's transmission via banknotes further fueled this shift. Recognizing this trend, governments often disbursed financial aid through digital means, and financial institutions expanded their digital services, encompassing payments, savings, lending, and insurance.

However, the journey towards comprehensive digital financial inclusion is fraught with challenges. Not everyone has access to essential digital tools like smartphones or the internet. There's also a palpable hesitancy among some segments of the population to adopt digital financial services due to fraud concerns or mistrust in digital platforms. While there's a growing trend towards digital literacy, understanding how to navigate digital financial platforms effectively remains paramount. Notably, gender disparities in digital access, termed as 'digital divides', persist, prompting policymakers to address them.

This paper examines the role of the COVID-19 pandemic in bolstering digital financial inclusion within the Association of Southeast Asian Nations (ASEAN) member states. With its rapidly expanding digital economy, ASEAN had already witnessed a rise in digital financial service providers before the pandemic. We argue that the pandemic acted more as a catalyst than a primary driver for this inclusion. The necessary infrastructure and initiatives for financial inclusion were already in place. ASEAN's pioneering efforts in the FinTech domain, evident from early-stage digital wallets and central bank digital currencies, suggest that widespread financial inclusion was inevitable. The pandemic merely expedited this process, with governments amplifying their inclusion efforts and consumers increasingly opting for digital transactions. Given ASEAN's pre-existing digital foundation, its trajectory towards digital financial inclusion is anticipated to outpace other regions.

Apart from inclusion as a whole, ensuring equitable access to financial systems has been a focal point for policymakers. The ASEAN region, with its rich cultural tapestry and historical significance, offers a compelling backdrop to explore gender disparities in payment mechanisms. Notably, Southeast Asia is home to several matrilineal societies where women are at the forefront of domestic financial management, decision-making, and property rights. For instance, the Minangkabau women of Indonesia and Malaysia, representing the world's most extensive matrilineal society, are revered for their financial acumen, a trait often perceived as lacking in their male counterparts ([Papanek and Schwede, 1988](#)). Similarly, Vietnam's Cham community is distinguished by its matriarchal inheritance practices ([Phan, 2019](#)). In the Philippines, historical records indicate that women, prior to colonial influences, had the autonomy to own property and engage in commerce ([Daniels, 2017](#)). Presently, the increasing mobility of Southeast Asian women, especially from countries like the Philippines and Indonesia, underscores the importance of financial account ownership for remittances ([Asis, 2003](#)). Concurrently, there's a noticeable uptick in women's educational achievements and workforce participation in the

region, further amplifying their financial engagements (Llanto and Rosellon, 2017).

Given ASEAN's distinctive milieu, this study offers two primary insights. Initially, it delineates the trajectory of digital financial inclusion in ASEAN amidst the global backdrop during the COVID-19 era. Subsequently, it delves into the gender-centric nuances within ASEAN's payment infrastructure, especially as the pandemic spurred a shift towards digital financial platforms. Drawing from the World Bank's 2017 and 2021 Global Findex Database, this research evaluates financial inclusivity across conventional and emerging payment avenues in the ASEAN nations. The study emphasizes traditional payment methods, such as cash and banking transactions, while also gauging the gender-specific disparities in daily transactional behaviors across the region and its individual member states.

Our analytical approach, which employs a probit model, is inspired by the work of Fungáčová and Weill (2015). They delved into financial inclusion and the gender disparity within China's context, utilizing the 2015 Global Findex Database. However, our research departs from Fungáčová and Weill (2015) in several aspects. Firstly, we explore inclusion across both traditional and digital payment channels. While data on mobile money is not available for China, it is accessible for the majority of ASEAN nations, allowing us to probe the interplay between physical and mobile monies. Secondly, our study zeroes in on the ASEAN region, a conglomerate of nations at varied developmental phases, facilitating nuanced cross-country comparisons. Lastly, we harness the two most recent iterations of the Global Findex Survey Database from 2017 and 2021, offering insights from both pre and post-pandemic periods.

A sneak peek into our findings reveals that, during the COVID-19 crisis, ASEAN managed to expedite its digital financial inclusion at a pace surpassing other regions, a feat attributable to its pre-existing digital infrastructures and initiatives. We also discern that women in ASEAN predominantly opt for cash as their payment method compared to men. Additionally, our data suggests a discernible gender gap in the transition toward advanced digital payment avenues.

The remainder of the paper is organized as follows: [Section 2](#) provides a brief background into financial inclusion and digital finance in ASEAN, [Section 3](#) elaborates on the empirical framework, [Section 4](#) provides the empirical results with robustness checks, [Section 5](#) discusses transition toward digital payment during the pandemic, and [Section 6](#) concludes.

## 2. Background

### *2.1. Digital financial inclusion initiatives in ASEAN*

Before the COVID-19 pandemic, the ASEAN region was already on a trajectory towards enhancing digital financial inclusion. In 2015, the region established the ASEAN Financial Inclusion Framework, which recognized the transformative potential of digital financial services. This framework aimed to leverage technology to enhance financial access across member states, setting the stage for innovative solutions in the subsequent years.

One of the most notable trends was the rise of mobile money platforms and e-wallets. Platforms like GCash in the Philippines, GrabPay in Singapore, and GoPay in Indonesia emerged as popular methods for payments, remittances, and even savings. These platforms not only

provided convenience but also brought financial services closer to those who previously had limited access to traditional banking.

In addition to mobile platforms, there was a shift in the regulatory landscape to accommodate the digital age. Countries like Singapore began issuing digital banking licenses, allowing non-traditional financial institutions to offer banking services. This move was seen as a significant step towards boosting financial inclusion by bringing diverse players into the banking fold.

Another innovative approach was adopting national QR code payment systems, such as Thailand's PromptPay and Singapore's SGQR. These systems aimed to standardize and promote cashless transactions, making it easier for consumers and merchants to transact without cash. Concurrently, Peer-to-Peer (P2P) lending platforms gained popularity in countries like Indonesia and the Philippines. These platforms offered an alternative source of credit, especially beneficial for micro, small, and medium enterprises (MSMEs) and individuals outside the purview of traditional banking.

To foster FinTech innovation while ensuring consumer protection, countries like Malaysia, Singapore, and Thailand introduced regulatory sandboxes. These controlled environments allowed fintech startups to test their solutions, ensuring they met regulatory standards while encouraging innovation. On the regional front, efforts like the ASEAN Single Window initiative were launched to simplify and digitize cross-border payments, promoting economic integration by enabling the electronic exchange of trade-related documents.

Recognizing the role of education in financial inclusion, several ASEAN member states initiated financial literacy programs. These programs aimed to equip their populations with the knowledge needed to navigate the evolving digital financial landscape. Infrastructure development also received attention, with investments channeled into expanding internet access and enhancing cybersecurity frameworks. These efforts were complemented by public-private partnerships, where governments collaborated with private sector players, including telecom operators and fintech startups, to drive the adoption of digital financial services.

In countries with significant rural populations, like Cambodia and Myanmar, microfinance institutions began to adopt digital tools. This shift made it easier for rural and underserved communities to access credit and other financial services, bridging the urban-rural divide.

## *2.2. Financial inclusion and the gender gap*

Financial inclusion, as defined by the World Bank, ensures that individuals and businesses have access to essential financial products and services. Digital financial inclusion uses digital means to reach those currently excluded, offering services tailored to their needs. Research indicates that financial inclusion boosts human development ([Anand and Chhikara, 2013](#)), GDP ([Van et al., 2021](#)), and employment. It also aids the poor in accessing education and healthcare, enhancing their quality of life ([Ma'ruf and Aryani, 2019](#)). Financial inclusion can also stimulate entrepreneurship by easing credit constraints ([Fan and Zhang, 2017](#)).

However, 31% of the global population remains unbanked, with women constituting 56% of this group ([Demirguc-Kunt et al., 2018](#)). Various studies have explored behavioral factors, such

as risk aversion and discrimination, that contribute to this disparity (Stephan and El-Ganainy, 2007). Globally, barriers like high account maintenance costs and stringent identification requirements further widen the gender gap in financial inclusion (Sioson and Kim, 2019).

The rapid advancement of information technology has revolutionized digital finance, attracting previously unbanked individuals (Evstratov, 2021). Innovations driven by artificial intelligence and the increasing affordability of digital devices have spurred fintech growth. ASEAN, with its burgeoning internet market, is primed to harness these technological advancements. The region’s digital economy could potentially contribute US\$1 trillion to its GDP by 2025 (A.T. Kearney and Group, 2015). The COVID-19 pandemic further accelerated the shift towards digital finance, with digital payments witnessing a global surge (Pandey et al., 2020).

Digital financial tools can empower women, formalizing their transactions and granting them control over their financial destinies (Sioson and Kim, 2019). However, a significant gender gap persists in mobile ownership and digital financial service access (Hilbert, 2011). Overcoming these challenges is crucial to fully integrate women into the digital revolution and achieve comprehensive financial inclusion.

### 3. Empirical framework and data

#### 3.1. Testable hypotheses

The fundamental research question we aim to answer is whether the COVID-19 pandemic has catalyzed digital financial inclusion in the ASEAN region, given ASEAN’s existing digital infrastructures and initiatives. Our focus is on the payment system. The subsequent analyses revolve around testing three simple hypotheses related to digital payment during the pandemic:

1. If the COVID-19 pandemic has catalyzed digital payment adoption, then cash would be replaced by mobile money or other digital payment channels.
2. If ASEAN’s digital infrastructures and initiatives before the pandemic were useful, then ASEAN’s digital financial inclusion should develop faster than elsewhere when the region was hit by COVID-19.
3. Women in ASEAN, due to the cultural context, are more used to traditional payment channels such as cash.

#### 3.2. Empirical framework

To test the above hypotheses, we estimate the following probit model:

$$y_{ict}^p = \alpha_0 + \alpha_1 female_{ict} + \alpha_2 age_{ict} + \alpha_3 age_{ict}^2 + \sum_l \kappa^l inc_{ict}^l + \sum_e \delta^e edu_{ict}^e + \gamma_{ct} + \epsilon_{ict} \quad (1)$$

where,

- the outcome variable  $y_{ict}^p$  is binary, set to 1 if individual  $i$  in country  $c$  at time  $t$  utilized payment mode  $p$  within the last 12 months, and 0 if not. Here,  $p$  can be cash, financial institutions, or mobile money. We examine three outcome variables related to access to these payment methods;

Table 1: Country-level Findex data respondents in ASEAN

Economy	Year			Total
	2017	2021	2022	
Cambodia	1,600	1,000	0	2,600
Indonesia	1,000	1,062	0	2,062
Lao PDR	1,000	1,000	0	2,000
Malaysia	1,004	1,000	0	2,004
Myanmar	1,600	1,000	0	2,600
Philippines	1,000	1,000	0	2,000
Singapore	1,000	1,000	0	2,000
Thailand	1,000	1,017	0	2,017
Vietnam	1,002	0	1,000	2,002
Non-ASEAN	144,717	119,775	15,033	279,525
<b>Total</b>	<b>154,923</b>	<b>127,854</b>	<b>16,033</b>	<b>298,810</b>

- $female_{ict}$  is 1 if individual  $i$  in country  $c$  is female, and 0 if male. A result of  $\alpha_1 < 0$  suggests that, on average, women have lesser access to payment channel  $p$  compared to men;
- $age_{ict}$  represents the age of individual  $i$  from country  $c$  at time  $t$ . We also include the squared age variable to capture potential non-linear effects between age and access to payments;
- $inc_{ict}^l$  is binary and is set to 1 if the income level of individual  $i$  in country  $c$  during time  $t$  falls in quintile  $l$ , and 0 if not. We have four categories for income, using the remaining quintile as a reference;
- $edu_{ict}^e$  is 1 if the highest educational attainment of individual  $i$  in country  $c$  at time  $t$  is  $e$ , and 0 otherwise. In this context,  $e$  has two binary categories, with primary education serving as the reference point; and
- $\gamma_{ct}$  represents fixed effects for country and time, capturing unobservable characteristics related to both.

### 3.3. Data

We draw upon the 2017 and 2021 Global Findex Database (Demirguc-Kunt et al., 2018) from the World Bank to gather insights on individuals' access to diverse payment methods globally. Recognized as the most exhaustive dataset detailing adult financial behaviors, the Global Findex Database encompasses data from over 150,000 adults across 144 economies, covering nearly 97% of the world's populace. Primarily, the information is garnered through direct interviews. The data collection process is meticulously designed, with primary sampling units often stratified based on population density or geographical considerations. In regions where telephonic surveys are feasible, a systematic approach using a comprehensive list of national phone numbers is adopted. The 2017 dataset spans the entire year and extends to early 2018, while the 2021 dataset covers the period between 2021 and 2023. Our focus predominantly lies on data from the ASEAN member states including Cambodia, Lao PDR, Indonesia, Malaysia, Myanmar,

Table 2: Summary statistics (ASEAN member states).

Variable	Obs	Mean	Std. dev.	Min	Max
Cash	19,285	.4785066	.4995508	0	1
Fin. Inst.	19,285	.5526057	.4972378	0	1
Mob. Money	19,285	.1465388	.3536547	0	1
Female	19,285	.5809178	.4934217	0	1
Age	19,271	40.26854	16.24868	15	99
Income					
Poorest 20%	19,285	.1838735	.387391	0	1
Second 20%	19,285	.1786881	.3831009	0	1
Middle 20%	19,285	.191859	.393773	0	1
Fourth 20%	19,285	.2051854	.4038475	0	1
Richest 20%	19,285	.2403941	.4273339	0	1
Education					
completed primary or less	19,070	.4216046	.4938289	0	1
secondary	19,070	.4282119	.4948326	0	1
completed tertiary or above	19,070	.1501835	.3572606	0	1

Philippines, Singapore, Thailand, and Vietnam. The respondent count from each ASEAN member state is detailed in [Table 1](#). Notably, Vietnam’s survey was conducted in 2022, a tad later than its ASEAN counterparts.

Our analysis leans on the survey details related to the accessibility of various payment channels, encompassing cash, financial institutions, and mobile money. The survey probes into the individual’s access these payment channels, specifically for daily purchases and utility bill settlements over the previous year. We categorize cash transactions as non-digital, while interactions with financial institutions and mobile money are deemed digital. Responses that were ambiguous or withheld were excluded from our analysis.

In addition to payment-related data, we also incorporate responses to socio-economic queries, touching upon aspects like gender, age, income bracket, and educational background. As delineated in [Eq. \(1\)](#), barring age, all variables in our study adopt a binary format. A comprehensive overview of the variables integral to our research is presented in [Table 2](#).

## 4. Digital financial inclusion via ASEAN payment channels

### 4.1. ASEAN vs world

Our first set of results is an overview of the digital financial inclusion in ASEAN during COVID-19, compared to the rest of the world. The three columns in [Table 3](#) contain results from regressions with three different dependent variables, namely, access to financial institutions, cash usage, and access to mobile money. In the table, we present the key estimated coefficients. These are the intercepts regarding gender, region, pandemic, and respondents’ characteristics, including age, education, and income. We also consider interactions between these variables.

In this set of results, we are interested in ASEAN’s digital financial inclusion as a region. As such, all ASEAN member states are represented by the indicator variable *ASEAN*. To better understand the meaning of this coefficient, we use China as the reference country for analyzing access to financial institutions and cash usage, due to its proximity to ASEAN. For the remaining



payment channel of mobile money, we use India as the reference country, as mobile money is gaining increasing popularity in India.

Table 3 shows the determinants of financial inclusion worldwide. We use the highest income quintile and tertiary education as the reference categories. Consistent with findings from earlier studies by Fungáčová and Weill (2015) and Demirgüç-Kunt et al. (2013), income and education are positively related to access to financial institutions and mobile money. As for cash usage, we find that the coefficient for those with tertiary or above education is negative. This is understandable as these groups may prefer alternative payment channels. The Age variable and its square both have significant coefficients, indicating that access to the payment channels increases with age but also decreases for older people.

We make three observations regarding digital financial inclusion worldwide and in ASEAN. First, we find evidence that cash usage was replaced by digital payment channels after the pandemic, supporting the first hypothesis we listed earlier. The coefficient for COVID is negative and significant for cash usage, but positive and significant for access to financial institutions and mobile money. The opposite signs mean that access to the digital and non-digital payment channels simultaneously moved in opposite directions. The dynamics in ASEAN are seen from the combined effect of COVID and ASEAN  $\times$  COVID, which is also negative for cash usage, and positive for the two digital payment channels. Specifically, access to mobile money in ASEAN has increased more than elsewhere after the pandemic, which supports our second hypothesis.

Second, worldwide, the payment channels we examine have generally been less accessible to women than men, but the gender gap has been mitigated during the pandemic. The gender gap is seen from the negative and significant coefficients for Female, for all three dependent variables. The negative coefficients imply that being a female is associated with poorer access to cash usage and accounts. Comparing the magnitudes of these coefficients, we find that cash is the most accessible, among the three, to women. We also see that the gender gap has been partially mitigated recently: The coefficients of the interaction term Female  $\times$  COVID are positive and significant, implying a narrowing gender gap after COVID-19. The extent to which the gender gap is mitigated is comparable across the three payment means.

Third, women in ASEAN are generally more accessible than elsewhere to payment means, but a gender gap still exists in access to digital payment channels. The coefficient of the interaction term Female  $\times$  ASEAN is positive and significant for all three dependent variables. This coefficient estimates the difference, between ASEAN and the rest of the world, in the relationship between being a female and the likelihood of having access to the payment channels. A positive coefficient implies that a female is more likely to have access to the payment means in ASEAN than elsewhere. Contrary to what we find in the rest of the world, ASEAN women are more likely to be cash users and account holders at financial institutions. This result supports our third hypothesis that ASEAN women are more likely to use traditional payment methods. Summing the coefficients of Female and Female  $\times$  ASEAN gives the main gender effect in ASEAN. The result is that women in ASEAN are more likely than men to use cash, but for the digital payment channels, the coefficients are still negative, implying the presence of a gender

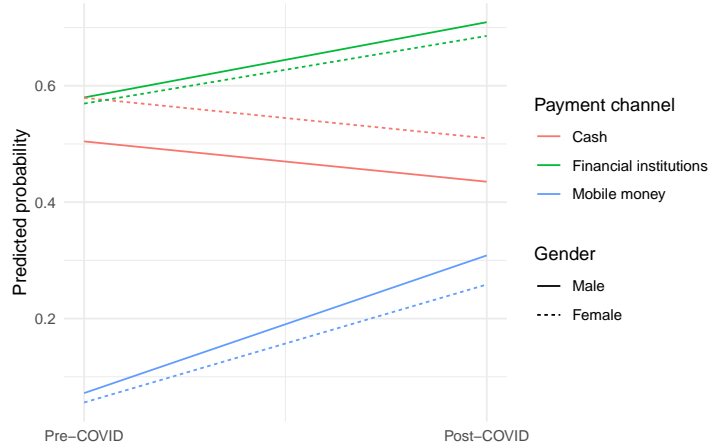


Figure 1: Access to payment channels pre- and post-COVID in ASEAN.

gap. This gender gap has not been mitigated after the pandemic, as the coefficient for the triple interaction term  $\text{Female} \times \text{ASEAN} \times \text{COVID}$  is insignificant or negative for all three payment channels.

The comparison for pre- and post-pandemic, and the changes in the gender gap, are best viewed through a figure. We plot the predicted probability in Fig. 1, assuming a representative individual with median characteristics among the survey respondents from ASEAN. Specifically, this hypothetical person is one aged 38, having income in the third quintile, and secondary education. If we toggle the `Female` and `COVID` variables between 0 and 1, we are able to show the change in the predicted probabilities before and after the pandemic, for men and women. Consistent with the observations we have described, cash usage has slowed down after the pandemic, replaced by access to digital payment channels. We can also see a widening gap in the digital payment channels as the distances between the solid and the dashed lines increase in access to financial institutions and mobile money.

In summary, the comparison between ASEAN and the rest of the world has revealed that cash is being replaced by alternative digital payment channels after the COVID-19 pandemic. However, it is important to note that ASEAN is a group of countries at different stages of development. While treating the ASEAN as one single entity helps to understand the general trends in the region, individual member states' characteristics should not be ignored either. In the next section, we will dive into sub-sample analyses for the ASEAN member states.

#### 4.2. Intra-ASEAN experience

We perform sub-sample analyses to take a closer look at digital financial inclusion in individual ASEAN member states. In Tables 4 to 6, we present the results for cash usage, access to financial institutions, and access to mobile money. To keep the paper concise, we do not show the coefficients of the control variables, i.e., income and education, but are ready to provide the results upon request.

Two key findings have emerged from these sub-sample analyses. The first is that access to

Table 3: Probit regressions: ASEAN vs world.

	(1) Cash	(2) Fin. Inst.	(3) Mob. Money
Female	-0.0685*** (-8.94)	-0.222*** (-26.38)	-0.214*** (-15.88)
ASEAN	0.128*** (4.40)	-0.972*** (-31.14)	0.310*** (4.83)
Female × ASEAN	0.258*** (9.60)	0.195*** (7.05)	0.0841* (1.76)
COVID	-1.590*** (-33.48)	0.637*** (14.11)	0.807*** (12.93)
Female × COVID	0.0357*** (3.12)	0.0392*** (3.13)	0.0309* (1.75)
ASEAN × COVID	1.416*** (25.60)	-0.288*** (-5.33)	0.154** (2.08)
Female × ASEAN × COVID	-0.0369 (-0.95)	-0.0802** (-1.98)	-0.0490 (-0.86)
Age	0.0336*** (42.19)	0.0501*** (57.70)	0.0269*** (16.91)
Age × Age	-0.000241*** (-28.25)	-0.000466*** (-49.19)	-0.000419*** (-21.33)
Poorest 20%	-0.0259*** (-2.93)	-0.566*** (-59.01)	-0.503*** (-36.12)
Second 20%	0.0171** (2.00)	-0.446*** (-47.89)	-0.359*** (-27.51)
Middle 20%	0.0211** (2.57)	-0.348*** (-38.62)	-0.269*** (-22.12)
Fourth 20%	0.00983 (1.23)	-0.236*** (-27.07)	-0.168*** (-14.77)
completed primary or less	0.197*** (20.21)	-1.122*** (-98.09)	-0.821*** (-54.06)
secondary	0.219*** (26.62)	-0.601*** (-58.44)	-0.373*** (-28.74)
Constant	-1.287*** (-44.36)	0.893*** (28.12)	-1.547*** (-24.47)
Observations	295805	294807	166004
Pseudo R-squared	0.185	0.371	0.264

t statistics in parentheses

With country-wave FE. Reference countries: China (1 & 2), India (3).

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 4: ASEAN digital financial inclusion: Cash usage.

	(1) KHM	(2) IDN	(3) LAO	(4) MYS	(5) MMR	(6) PHL	(7) SGP	(8) THA	(9) VNM
Female	0.255*** (3.74)	0.0977 (1.13)	0.339*** (3.88)	0.0271 (0.27)	0.105 (1.52)	0.353*** (4.33)	-0.0579 (-0.61)	0.0961 (1.03)	0.368*** (3.96)
COVID	0.375*** (4.25)	-0.0718 (-0.80)	-0.0605 (-0.64)	0.212** (2.23)	0.0461 (0.53)	-0.233** (-2.56)	-0.174* (-1.69)	-1.025*** (-10.01)	-0.976*** (-10.37)
Female × COVID	-0.0637 (-0.58)	0.0391 (0.33)	-0.0386 (-0.31)	-0.157 (-1.17)	-0.284*** (-2.58)	-0.154 (-1.31)	-0.0182 (-0.13)	-0.0459 (-0.36)	0.175 (1.39)
Age	0.0203*** (2.62)	0.0903*** (8.80)	0.101*** (10.42)	0.0449*** (4.25)	0.0726*** (7.97)	0.0786*** (8.79)	0.0149 (1.37)	0.0441*** (4.03)	0.0980*** (9.58)
Age × Age	-0.000167* (-1.96)	-0.000872*** (-7.08)	-0.00101*** (-9.07)	-0.000331*** (-2.86)	-0.000715*** (-6.95)	-0.000725*** (-7.16)	-0.0000569 (-0.05)	-0.000383*** (-3.24)	-0.000888*** (-7.73)
Constant	-0.317 (-1.26)	-2.243*** (-8.70)	-2.071*** (-9.25)	-2.394*** (-9.87)	-1.837*** (-8.41)	-1.875*** (-9.00)	-1.837*** (-6.59)	-1.166*** (-4.42)	-1.922*** (-8.46)
Observations	2543	2062	1997	1902	2599	1999	1986	1990	1979
Pseudo R-squared	0.023	0.060	0.078	0.072	0.045	0.073	0.078	0.262	0.178

t statistics in parentheses

Controls: educ, inc\_q. KHM: Cambodia; IDN: Indonesia; LAO: Lao PDR; MYS: Malaysia; MMR: Myanmar; PHL: Philippines; SGP: Singapore; THA: Thailand; VNM: Vietnam.

\* p&lt;0.10, \*\* p&lt;0.05, \*\*\* p&lt;0.01

accounts has increased during COVID-19, in place of declining cash usage. The second is that the gender gap is present only in a handful of the ASEAN member states. These findings will be elaborated shortly.

#### 4.2.1. Cash usage

Regarding cash usage, the ASEAN member states have exhibited heterogeneous trends over time. Cash usage has declined in the Philippines, Singapore, Thailand, and Vietnam. This is evidenced by the negative and significant coefficients of the indicator variable COVID, which measures the main effect of a time change before and after the pandemic. The declines in these four member states were of different magnitudes, with Thailand and Vietnam seeing the strongest declines. Apart from these four member states experiencing declining cash usage, Cambodia and Malaysia, however, have seen an increase in cash usage over time. We interpret the increase in cash usage a sign that more people are taking part in economy activity.

As for the gender gap, females are more likely to use cash in the ASEAN member states, a consistent finding with Table 3's. Particularly, the likelihood of cash being used by females is significantly higher than by males in Cambodia, Laos, the Philippines, and Vietnam. After the pandemic, this gender gap remains unchanged in most of the ASEAN member states, except Myanmar, in which we observe declining usage of cash by females. This is seen from the combined effect of the COVID indicator and the interaction term Female × COVID.

#### 4.2.2. Financial institutions

Access to financial institutions has generally increased over time in the ASEAN member states. The coefficient of COVID is positive and significant for Cambodia, Laos, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam. This is expected, as the COVID-19 pandemic was a catalyst for digital payments. When lockdowns were in place worldwide, and when cash usage declined, alternative payment means ought to replace cash for economic activity to continue. Having accounts at financial institutions naturally became the next-best solution in places where

Table 5: ASEAN digital financial inclusion: Access to financial institutions.

	(1) KHM	(2) IDN	(3) LAO	(4) MYS	(5) MMR	(6) PHL	(7) SGP	(8) THA	(9) VNM
Female	0.0266 (0.33)	0.0647 (0.78)	0.212** (2.30)	-0.231* (-1.91)	-0.0592 (-0.81)	0.263*** (2.99)	-0.756*** (-2.91)	-0.119 (-1.22)	-0.00200 (-0.02)
COVID	0.368*** (3.67)	0.0229 (0.26)	0.303*** (2.98)	0.432*** (3.33)	0.514*** (6.02)	0.671*** (7.07)	-0.567** (-2.04)	0.851*** (5.34)	0.633*** (6.50)
Female × COVID	0.0325 (0.26)	-0.0225 (-0.19)	-0.0801 (-0.63)	0.0775 (0.45)	-0.0713 (-0.65)	-0.328*** (-2.63)	0.737** (2.32)	0.0437 (0.21)	-0.124 (-0.97)
Age	0.0355*** (3.88)	0.0452*** (4.29)	0.0314*** (3.08)	0.0695*** (5.43)	0.0489*** (5.16)	0.0305*** (3.22)	0.0904*** (4.93)	0.0369*** (2.85)	0.0934*** (7.06)
Age × Age	-0.000416*** (-4.02)	-0.000569*** (-4.44)	-0.000261*** (-2.21)	-0.000666*** (-4.86)	-0.000415*** (-3.77)	-0.000259** (-2.40)	-0.000933*** (-4.94)	-0.000367*** (-2.78)	-0.00128*** (-7.75)
Constant	0.436 (1.49)	0.522* (1.81)	0.249 (1.04)	0.789*** (2.78)	-0.531** (-2.43)	-0.0291 (-0.13)	1.129** (2.32)	0.811** (2.32)	-0.728*** (-2.73)
Observations	2543	2062	1997	1902	2599	1999	1986	1990	1979
Pseudo R-squared	0.094	0.067	0.155	0.172	0.133	0.178	0.157	0.152	0.219

t statistics in parentheses

Controls: educ, inc\_q. KHM: Cambodia; IDN: Indonesia; LAO: Lao PDR; MYS: Malaysia; MMR: Myanmar; PHL: Philippines; SGP: Singapore; THA: Thailand; VNM: Vietnam.  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

banking facilities were already available. Particularly, the increase in access to financial institutions in the Philippines, Thailand, and Vietnam is a sign that transactions are replacing cash through accounts, as cash usage has significantly declined in these countries during the same period. We interpret the simultaneous increase in cash usage and access to financial institutions in Cambodia and Malaysia as an increase in financial inclusion and economic activity, as people have access to more payment options.

One intriguing result is the case of Singapore, where there was a decline in access to financial institutions. Despite the coefficient's significance, we note that access to financial institutions is almost saturating in Singapore. A further analysis will follow, discussing the reasons for having no accounts at financial institutions in Singapore.

ASEAN women, in general, are not disadvantaged in access to financial institutions. In Malaysia and Singapore, the coefficient of **Female** is negative, implying a gender gap that women have less access to financial institutions in these two countries. However, a closer look at the survey data suggests again that Malaysia and Singapore had the most respondents accessing financial institutions, despite small differences between the male and female ownerships. Among the other ASEAN member states, especially Laos and the Philippines, our regressions find higher access to financial institutions by females.

Over time, the gender gap in access to financial institutions has not changed significantly after the pandemic. The coefficient for **Female × COVID** is insignificant for most countries, except for the Philippines and Singapore, where we see reversals in the gender effect. The reversals result in coefficients around 0 for the female indicator post-COVID, implying that women and men had more or less equal access to financial institutions in the Philippines and Singapore now.

#### 4.2.3. Mobile money accounts

Access to mobile money has increased in most ASEAN member states. This is evidenced by the positive and significant coefficient of **COVID** in all countries except Cambodia. The increase is

Table 6: ASEAN digital financial inclusion: Mobile money.

	(1) KHM	(2) IDN	(3) LAO	(4) MYS	(5) MMR	(6) PHL	(7) SGP	(8) THA	(9) VNM
Female	-0.0452 (-0.41)	-0.184 (-1.13)	-0.250 (-1.60)	-0.159 (-1.41)	-0.0605 (-0.21)	-0.0685 (-0.44)	-0.311** (-2.57)	-0.242* (-1.76)	0.0874 (0.49)
COVID	-0.0994 (-0.71)	0.312** (2.09)		0.620*** (5.73)	2.167*** (9.36)	1.052*** (8.00)	0.853*** (7.74)	1.750*** (14.00)	0.953*** (5.90)
Female × COVID	0.00364 (0.02)	0.0950 (0.47)		0.161 (1.10)	-0.107 (-0.36)	-0.0131 (-0.07)	0.151 (1.00)	0.280* (1.72)	-0.190 (-0.92)
Age	0.0192 (1.44)	-0.0509** (-2.00)	0.0841* (1.88)	0.0498*** (2.82)	-0.00455 (-0.21)	0.0615*** (2.93)	0.0579*** (3.50)	0.00337 (0.23)	-0.00758 (-0.34)
Age × Age	-0.000293* (-1.93)	0.000351 (0.97)	-0.00159*** (-2.40)	-0.000908*** (-3.88)	-0.000314 (-1.02)	-0.00101*** (-3.50)	-0.000852*** (-4.29)	-0.000318* (-1.91)	-0.000212 (-0.69)
Constant	-0.919*** (-2.67)	0.529 (1.17)	-0.875 (-1.16)	-1.121*** (-3.58)	-1.203*** (-2.89)	-1.525*** (-3.89)	-1.885*** (-5.28)	-0.545* (-1.67)	-0.571 (-1.36)
Observations	2543	2062	999	1902	2599	1999	1986	1990	1979
Pseudo R-squared	0.043	0.164	0.308	0.148	0.459	0.269	0.202	0.439	0.218

t statistics in parentheses

Controls: educ, inc\_q. KHM: Cambodia; IDN: Indonesia; LAO: Lao PDR; MYS: Malaysia; MMR: Myanmar; PHL: Philippines; SGP: Singapore; THA: Thailand; VNM: Vietnam.  
\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

the strongest in Myanmar and Thailand. As in the case of financial institutions, the significant increase in mobile money account ownership was likely a result of the pandemic, when people resorted to alternative payment channels. We also note that there have been initiatives in Cambodia to promote digital payments, which may not have been captured by the data.

ASEAN women are not found to have less access to mobile money accounts than men in most ASEAN member states. The coefficient for **Female** is mostly insignificant, implying equal access by men and women in 2017. Two exceptions are Singapore and Thailand, where we see negative and significant coefficients. It is worth noting that mobile money had not taken off in 2017, so it is not surprising that mobile money usage might be limited to scenarios that were more relevant to males than females. By 2021, access to mobile money by women was almost equal to that by men, as we calculate the combined effect of **Female** and **Female × COVID**.

We summarize the findings with a figure showing the predicted probability. In Fig. 2, we plot the predicted probabilities from the regressions in this subsection, assuming a representative respondent from each ASEAN member state. With the exception of Cambodia and Lao PDR, access to mobile money has increased, along with access to financial institutions. The substitution between cash and mobile money is obvious in most countries. For instance, in Indonesia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam, there are clear negative correlations between cash usage and mobile money. For Malaysia, both cash usage and mobile money have increased, which might be due to increased economic activity after the pandemic.

### 4.3. Reasons for no accounts

#### 4.3.1. Singapore

One intriguing result from the previous regressions is that Singaporean women appear to be lagging in access to financial institutions, despite high account ownerships in Singapore. While we have shown Fig. 2 that access to financial institutions is almost at 100% for both men and women in Singapore, it would also be interesting to pin down the reason for this gender difference.

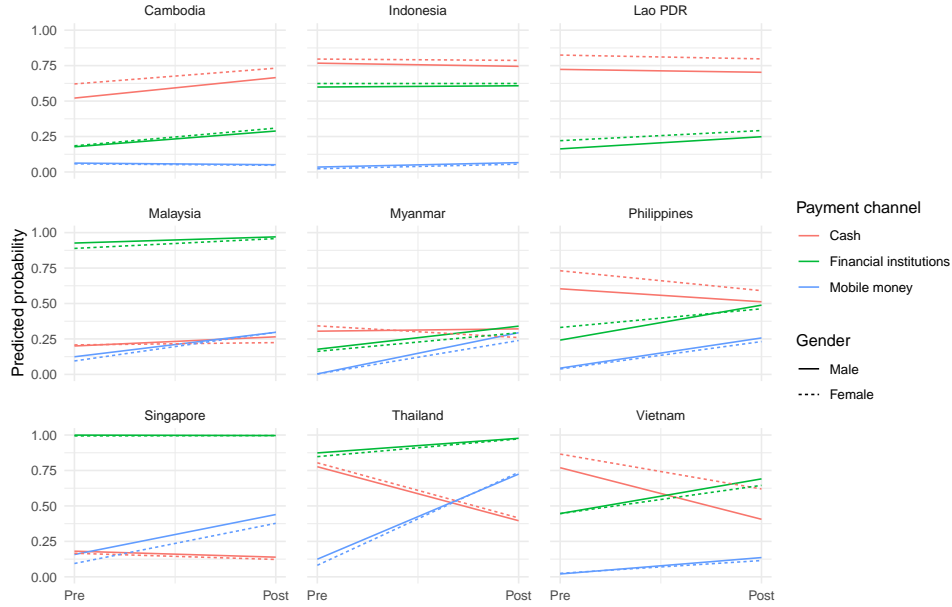


Figure 2: Predicted probabilities in ASEAN member states.

To do so, we use dependent variables, which are the reasons for respondents not having accounts at financial institutions. There are eight reasons provided by the Findex questionnaire: (1) too far; (2) too expensive); (3) lack documentation; (4) lack trust; (5) religious reasons; (6) lack money; (7) family member already has one; and (8) no need for financial services. The dependent variable takes value 1 if the respondent answered “yes” to the corresponding reason, and 0 otherwise. The independent variables are the same as the previous regressions. In the case of Singapore, there are not enough observations for the fifth reason of religion. We proceed with the probit regressions with the remaining seven reasons.

As shown by the results in [Table 7](#), the outcome that women do not have accounts at financial institutions is mostly likely due to family members already having accounts. The coefficient for **Female** is positive and significant for this reason only, implying a strong association between being a female and not having an account due to existing accounts in the family. As we have also observed in [Table 5](#), Singapore has seen an increase in accounts owned by females after the pandemic. We can infer from [Table 7](#) that Singaporean women might have become more prepared for account applications, and more independent from their families, as the lack of documentation and the existence of family accounts were less likely the reasons for not having accounts among Singapore women.

#### 4.3.2. The rest of ASEAN

We then repeat the analysis for the rest of the ASEAN member states and summarize the regression results in [Table 8](#). We include the intercepts for individual ASEAN member states, except Singapore, the reference country. The coefficients for the member states are then interpreted as differences vis-à-vis Singapore.

Continuing from the discussion on Singapore, we look at the existence of family members’

Table 7: Reasons for no account at financial institutions among Singaporean respondents.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Too far	Too exp.	Lack doc.	Lack trust	Lack mon.	Family	No need
Female	-0.369 (-0.93)	0.128 (0.28)	0.302 (0.89)	-0.365 (-0.91)	0.0808 (0.28)	0.471* (1.93)	0.448 (1.52)
Age	-0.0400 (-0.80)	0.0305 (0.57)	-0.107*** (-3.73)	-0.00126 (-0.03)	-0.0792*** (-3.64)	-0.0992*** (-4.74)	-0.0885*** (-4.34)
Age × Age	0.000345 (0.67)	0.0000297 (0.06)	0.00109*** (3.53)	0.0000500 (0.13)	0.000806*** (3.59)	0.00101*** (4.65)	0.000881*** (4.28)
COVID		-0.0231 (-0.08)	0.474 (1.48)	-0.0528 (-0.17)	0.409 (1.58)	0.218 (0.84)	0.451 (1.60)
Female × COVID			-0.724* (-1.71)	-0.0254 (-0.05)	-0.0355 (-0.10)	-0.557* (-1.78)	-0.552 (-1.59)
Constant	-0.636 (-0.60)	-4.092*** (-3.25)	-0.647 (-0.95)	-2.524** (-2.30)	-1.312*** (-2.60)	-0.748 (-1.56)	-1.030** (-2.21)
Observations	187	945	1500	916	1986	1986	1586
Pseudo R-squared	0.093	0.165	0.135	0.049	0.137	0.157	0.150

t statistics in parentheses

Controls: educ, inc\_q.

\* p&lt;0.10, \*\* p&lt;0.05, \*\*\* p&lt;0.01

accounts as a reason for not having access to financial institutions. With Singapore being the reference category, all other member states have shown a higher likelihood of not having accounts for this reason, though it becomes a weaker reason for Malaysia and Thailand after the pandemic, as seen from the negative coefficients of the interaction terms.

As for all the other reasons, all other ASEAN member states have higher probabilities than Singapore. By comparing the magnitudes of the coefficients, we can figure out the challenges faced by the ASEAN member states in access to financial institutions. For instance, having the largest coefficients, people in the Philippines likely see financial institutions as too far for them to access, and people in Cambodia are likely to cite lack of money as the reason for not having accounts at financial institutions.

Our regressions allow us to compare within each ASEAN member state the reasons for having no accounts at financial institutions. In Fig. 3, we show the pre- and post-COVID predicted probabilities for the eight reasons. Lack of money is a major reason in Cambodia, Indonesia, Lao PDR, and Myanmar. Malaysia, Singapore, and Thailand have relatively low predicted probabilities for all the reasons discussed.

## 5. Digital payment adoption during COVID-19

We have looked at the overall trend in access to payment channels in the ASEAN member states in the previous analyses. In the 2021 version of the Findex data, there are a few interesting variables that enable some analyses on digital adoption during COVID-19. These variables come from three questions asking respondents' payment choices after COVID-19, considering their pre-pandemic choices. The questions asked if the respondents had used digital payments for the first time for in-store purchases, online purchases, and utility bills, respectively, since the onset



Table 8: Reasons for no account at financial institutions among all ASEAN respondents.

	(1) Too far	(2) Too exp.	(3) Lack doc.	(4) Lack trust	(5) Religion	(6) Lack mon.	(7) Family	(8) No need
Female	-0.0881*** (-2.62)	-0.0751** (-2.07)	-0.0682** (-1.99)	-0.139*** (-3.18)	-0.0992* (-1.89)	-0.0133 (-0.45)	0.0975*** (2.70)	-0.0494 (-1.60)
COVID	0.0553 (0.65)	0.0307 (0.10)	0.0676 (0.34)	-0.107 (-0.39)	0.573** (2.44)	0.354** (2.01)	-0.0569 (-0.39)	0.150 (1.06)
Female × COVID	0.110** (2.19)	0.134** (2.51)	0.0522 (1.01)	0.118* (1.86)	-0.0211 (-0.28)	0.0703 (1.56)	-0.0398 (-0.76)	-0.00663 (-0.15)
Cambodia	1.969*** (10.01)	1.904*** (7.75)	1.620*** (10.41)	1.538*** (7.77)	2.266*** (5.93)	2.531*** (16.66)	0.720*** (6.38)	1.338*** (11.57)
Indonesia	1.877*** (9.47)	1.881*** (7.60)	1.282*** (8.03)	1.009*** (4.90)	1.852*** (4.78)	2.129*** (13.87)	1.105*** (9.85)	1.075*** (9.00)
Lao PDR	1.955*** (9.87)	1.542*** (6.20)	1.289*** (8.09)	0.946*** (4.59)	1.593*** (4.09)	2.441*** (15.89)	0.844*** (7.31)	1.512*** (12.87)
Malaysia	1.399*** (6.83)	1.572*** (6.20)	0.917*** (5.43)	1.156*** (5.57)	1.896*** (4.81)	1.217*** (7.53)	0.932*** (7.90)	0.977*** (7.83)
Myanmar	1.669*** (8.48)	1.106*** (4.46)	1.572*** (10.13)	0.444** (2.11)	1.491*** (3.86)	2.481*** (16.36)	0.449*** (3.91)	1.245*** (10.79)
Philippines	2.259*** (11.47)	2.552*** (10.34)	1.962*** (12.52)	1.662*** (8.32)	2.433*** (6.33)	2.420*** (15.73)	1.151*** (10.33)	1.569*** (13.44)
Thailand	1.154*** (5.69)	0.856*** (3.35)	0.443** (2.53)	0.409* (1.85)	0.886** (2.13)	1.086*** (6.90)	0.754*** (6.53)	0.931*** (7.74)
Vietnam	1.476*** (8.07)	1.393*** (5.55)	1.072*** (6.59)	1.142*** (5.58)	0.941*** (2.91)	1.978*** (12.82)	1.068*** (9.47)	1.716*** (14.72)
Cambodia × COVID	-0.0206 (-0.21)	-0.192 (-0.63)	-0.0187 (-0.09)	-0.0287 (-0.10)	-0.795*** (-3.30)	-0.114 (-0.62)	0.213 (1.36)	0.301** (2.02)
Indonesia × COVID	-0.0275 (-0.27)	0.0596 (0.20)	-0.00590 (-0.03)	0.154 (0.54)	-0.450* (-1.77)	-0.436** (-2.38)	0.209 (1.34)	0.0895 (0.58)
Lao PDR × COVID	0.00985 (0.10)	0.195 (0.64)	0.231 (1.11)	0.470 (1.64)	0.0438 (0.17)	-0.518*** (-2.83)	0.136 (0.85)	0.0566 (0.37)
Malaysia × COVID	-1.003*** (-6.18)	-1.187*** (-3.56)	-0.493** (-2.16)	-1.138*** (-3.34)	-1.818*** (-4.57)	-1.229*** (-5.89)	-0.363** (-2.16)	-0.587*** (-3.52)
Myanmar × COVID	0.302*** (2.98)	0.591* (1.93)	-0.0271 (-0.13)	0.958*** (3.30)	-0.0591 (-0.23)	-0.599*** (-3.29)	0.608*** (3.79)	0.182 (1.21)
Philippines × COVID	-0.255** (-2.49)	-0.256 (-0.84)	-0.367* (-1.77)	-0.0999 (-0.35)	-0.620** (-2.53)	-0.480*** (-2.62)	0.133 (0.85)	-0.340** (-2.22)
Thailand × COVID	-0.551*** (-3.55)	-0.447 (-1.30)	-0.245 (-0.98)	0.147 (0.46)	-0.470 (-1.24)	-0.952*** (-4.55)	-0.406** (-2.29)	-0.750*** (-4.32)
Vietnam × COVID		-0.126 (-0.40)	-0.456** (-2.09)	-0.0800 (-0.28)		-0.974*** (-5.23)	0.0545 (0.34)	-0.314** (-2.07)
Constant	-3.398*** (-15.71)	-3.513*** (-12.99)	-2.561*** (-14.08)	-3.059*** (-13.27)	-4.404*** (-10.33)	-3.313*** (-19.02)	-1.957*** (-13.87)	-2.450*** (-17.72)
Observations	18059	19057	19057	19057	18059	19057	19057	19057
Pseudo R-squared	0.137	0.183	0.167	0.126	0.150	0.275	0.074	0.123

t statistics in parentheses

Reference country: Singapore. Controls: educ, inc\_q, age.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

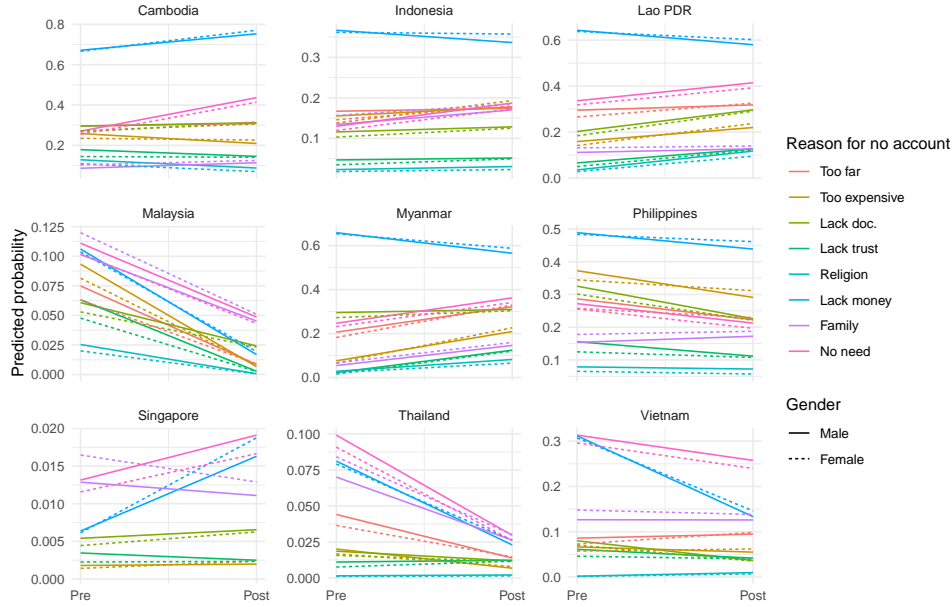


Figure 3: Predicted probabilities for reasons for no accounts at financial institutions.

of COVID-19, conditioning on the respondents using digital payments in the past 12 months. A “yes” answer means the respondent had switched from cash to digital payment during the pandemic. Whereas, a “no” answer means the respondent had been a user of digital payment before the pandemic.

We then construct four indicators on digital payment adoption. For the three scenarios of in-store purchases, online purchases, and utility bills, we let the value be 1 if a respondent answered “yes” to the above questions, and 0 if a respondent had used cash for the corresponding payment scenarios (from a preceding question in the Findex questionnaire). We discard the individuals who had been users of payments before the pandemic so that the constructed variables are solely on the switch to digital payment due to the pandemic. We also construct a variable that takes value 1 if a respondent had a “yes” answer to any of the three questions, capturing digital adoption across all payment scenarios.

### 5.1. ASEAN vs World

We first examine how ASEAN and the world have adopted digital payment. The regression results are shown in [Table 9](#), from which we draw three important findings. First, in the rest of the world, women appear to have adopted digital payment slower than men. The coefficient for `Female`, which estimates the relative likelihood of digital adoption by women, is negative for all four indicators. Except for digital payment for online purchases, the coefficient is significant for the overall digital adoption, in-store purchases, and utility bills. The interpretation is that being a female is associated with a smaller probability of switching from cash to digital payment during the COVID-19 pandemic.

Second, ASEAN, on average, has done better in overall digital payment adoption than China, but not so for individual payment channels. The coefficient for `ASEAN` is positive and significant

for the overall digital adoption, but negative or insignificant for in-store, online purchases and utility bills. This means that respondents in ASEAN have switched to digital payments in a wide range of scenarios, with little overlap.

Third, the main channel through which women in ASEAN adopted digital payment was online purchases. The coefficient for the interaction term `Female × ASEAN` is positive and significant, implying a higher likelihood for ASEAN women to switch from cash to digital payment during the pandemic. Looking across the individual payment scenarios, we find that this coefficient is significant only in the case of online purchases. As for in-store purchases and utility bills, there is no significant difference between men and women.

### 5.2. *Intra-ASEAN comparison*

We then zoom in to ASEAN and look for any heterogeneity across the ASEAN member states. The regression results are presented in [Table 10](#). In these regressions, Singapore is taken as the reference category. The coefficients for the other member states indicate their differences vis-à-vis Singapore.

Consistent with the regressions in [Table 9](#), women in ASEAN are more likely to adopt digital payment through the online purchase channel. This is seen from the positive and significant coefficient for online purchases (column 3). The coefficient for the overall digital adoption, however, is not significant in this table, due to the smaller sample size producing larger standard errors.

We can obtain a ranking of digital payment adoption from the coefficients for the ASEAN member states. From the first column, these coefficients are mostly significant but with varying signs. Thailand has the largest intercept, resulting in the largest likelihood among the ASEAN member states to switch towards digital payment. Singapore and the Philippines follow, also with positive coefficients. For in-store purchases, Singapore comes first, with the highest coefficient, followed by Thailand and Malaysia. For online purchases, Thailand, Vietnam, and the Philippines have the largest likelihood of digital adoption. And for utility bills, most member states have negative coefficients, implying that Singapore, Cambodia, and Malaysia are the ones with the largest likelihood. In [Fig. 4](#), we show the rankings of digital payment adoption among the ASEAN member states.

## 6. Conclusion

Financial inclusion plays a pivotal role in discussions about a nation or region's progress. In fact, the United Nations recognizes financial inclusion as a key facilitator for eight of the seventeen 2030 Sustainable Development Goals. Nevertheless, as digitization progresses, there's a risk of certain demographic segments being marginalized. It's imperative for policymakers to adopt holistic strategies, ensuring no gender-based disparities in financial access.

In this backdrop, our research delves into the digital financial landscape of the ASEAN payment systems. The evidence suggests that the COVID-19 crisis has significantly propelled the momentum of digital financial integration within the ASEAN territory. The conventional

Table 9: Global digital adoption.

	(1) COVID digi.	(2) In-store	(3) Online	(4) Bill
Female	-0.0637*** (-6.40)	-0.0923*** (-6.81)	-0.00969 (-0.70)	-0.0693*** (-5.42)
ASEAN	0.155*** (2.85)	-1.335*** (-16.01)	-0.114 (-1.48)	-0.403*** (-5.31)
Female × ASEAN	0.105*** (3.28)	0.0595 (1.42)	0.105*** (2.64)	0.0468 (1.11)
Age	0.0135*** (9.06)	0.0144*** (6.96)	0.00309 (1.31)	0.0345*** (17.95)
Age × Age	-0.000223*** (-13.19)	-0.000278*** (-11.53)	-0.000284*** (-9.90)	-0.000348*** (-16.18)
Poorest 20%	-0.307*** (-19.78)	-0.425*** (-19.94)	-0.465*** (-20.88)	-0.283*** (-14.22)
Second 20%	-0.230*** (-15.38)	-0.336*** (-16.37)	-0.316*** (-15.35)	-0.225*** (-11.75)
Middle 20%	-0.166*** (-11.67)	-0.233*** (-12.12)	-0.254*** (-13.10)	-0.157*** (-8.66)
Fourth 20%	-0.0952*** (-7.09)	-0.149*** (-8.23)	-0.135*** (-7.53)	-0.117*** (-6.74)
completed primary or less	-0.431*** (-25.71)	-0.610*** (-26.76)	-0.662*** (-29.06)	-0.396*** (-17.99)
secondary	-0.132*** (-9.53)	-0.298*** (-15.36)	-0.315*** (-17.64)	-0.129*** (-7.11)
Constant	-0.393*** (-8.79)	0.518*** (7.11)	0.500*** (6.41)	-1.471*** (-26.52)
Observations	103209	86137	95662	93513
Pseudo R-squared	0.103	0.162	0.202	0.103

t statistics in parentheses

With country FE. Reference country: China.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

Table 10: ASEAN digital adoption.

	(1) COVID digi.	(2) In-store	(3) Online	(4) Bill
Female	0.0471 (1.53)	-0.0170 (-0.41)	0.107*** (2.74)	-0.0303 (-0.75)
Age	-0.00788 (-1.59)	0.0212*** (3.08)	-0.0112 (-1.61)	0.0322*** (4.82)
Age × Age	-0.0000167 (-0.29)	-0.000428*** (-5.20)	-0.000182** (-2.07)	-0.000348*** (-4.56)
Cambodia	-0.668*** (-8.49)	-2.914*** (-16.13)	-1.071*** (-7.58)	-0.115 (-1.29)
Indonesia	-0.677*** (-9.76)	-2.042*** (-19.46)	-0.429*** (-4.09)	-0.520*** (-6.06)
Lao PDR	-1.078*** (-14.28)	-2.194*** (-20.25)	-0.745*** (-6.69)	-1.072*** (-10.27)
Malaysia	-0.269*** (-3.94)	-1.437*** (-14.96)	0.0569 (0.54)	-0.129 (-1.57)
Myanmar	-0.692*** (-9.93)	-1.904*** (-18.44)	-0.438*** (-4.14)	-1.124*** (-10.92)
Philippines	-0.128* (-1.89)	-1.924*** (-18.36)	0.219** (2.17)	-0.343*** (-4.18)
Thailand	0.104 (1.46)	-0.565*** (-5.51)	0.318*** (2.89)	-0.214** (-2.45)
Vietnam	-0.335*** (-5.02)	-1.944*** (-18.88)	0.223** (2.22)	-0.659*** (-7.54)
Constant	0.606*** (5.13)	1.279*** (7.94)	0.580*** (3.58)	-1.025*** (-6.76)
Observations	8316	7399	7281	7752
Pseudo R-squared	0.108	0.254	0.215	0.081

t statistics in parentheses

Reference country: Singapore. Controls: educ, inc\_q.

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

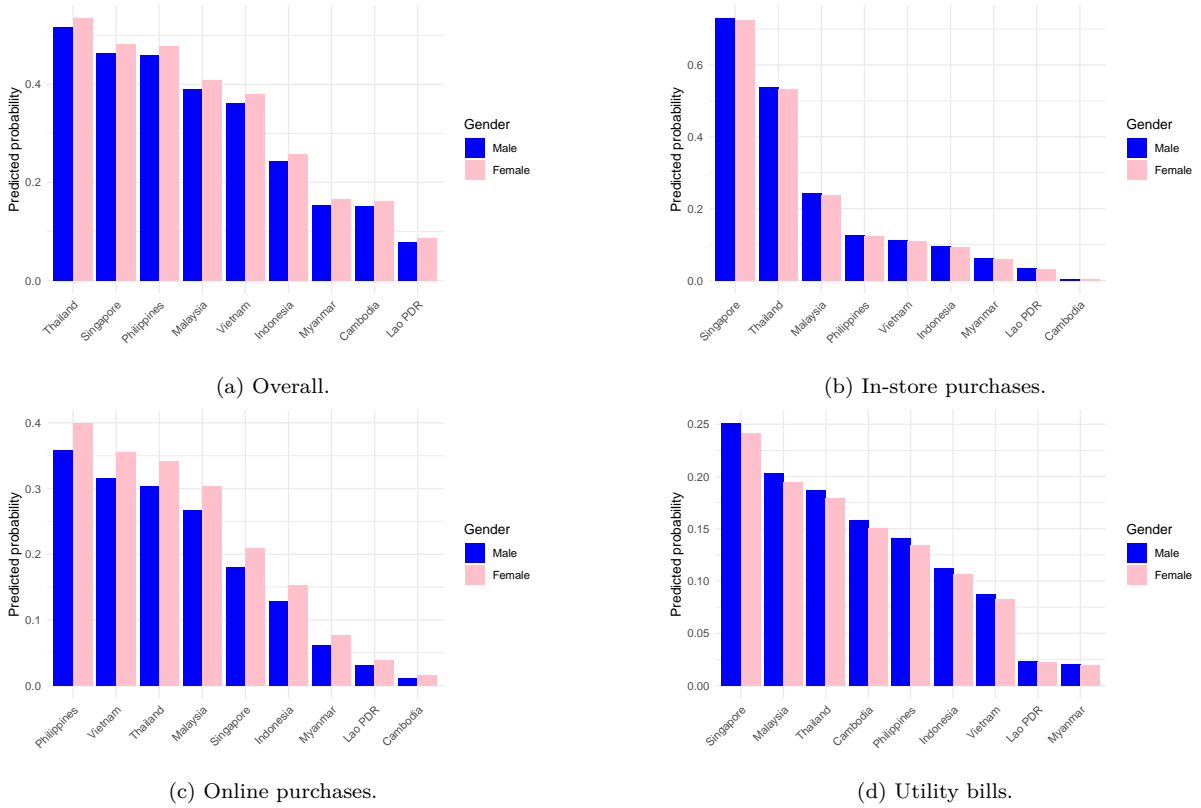


Figure 4: Digital payment adoption in ASEAN.

reliance on cash transactions is giving way to digital avenues, broadening the financial horizons for many.

A significant aspect of our investigation revolves around the gender dynamics within the ASEAN payment framework. The data indicates a pronounced inclination among women towards cash, a traditional mode of transaction. Interestingly, the pandemic era witnessed a swifter transition of women in ASEAN towards digital payment solutions, primarily for online shopping.

However, it's crucial to acknowledge the constraints of our research. The insights are grounded in survey responses spanning 2021 to 2023. While the COVID-19 outbreak has undeniably reshaped the digital payment landscape in ASEAN, our dataset might not encapsulate the very latest regional shifts. This underscores the importance of continued exploration into the evolving payment preferences in the future.

## References

- Anand, S., Chhikara, K.S., 2013. A theoretical and quantitative analysis of financial inclusion and economic growth. *Management and Labour Studies* 38, 103–133.
- Asis, M.M., 2003. Asian women migrants: Going the distance, but not far enough. *Migration Information Source* .
- A.T. Kearney, I., Group, A., 2015. *The ASEAN Digital Revolution*. A.T. Kearney. URL: <https://books.google.com.sg/books?id=QSYazgEACAAJ>.
- Daniels, M., 2017. The gender gap: What asia can learn from the philippines URL: <https://hcli.org/articles/gender-gap-what-asia-can-learn-philippines>.
- Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., Hess, J., 2018. *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. The World Bank.
- 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* .
- Evstratov, K., 2021. How technology can help unbanked access e-commerce URL: <https://www.weforum.org/agenda/2021/05/technology-help-unbanked-access-ecommerce/>.
- Fan, Z., Zhang, R., 2017. Financial inclusion, entry barriers, and entrepreneurship: Evidence from china. *Sustainability* 9, 203.
- Fungáčová, Z., Weill, L., 2015. Understanding financial inclusion in china. *China Economic Review* 34, 196–206.
- Hilbert, M., 2011. Digital gender divide or technologically empowered women in developing countries? a typical case of lies, damned lies, and statistics, in: *Women's Studies International Forum*, Elsevier. pp. 479–489.
- Llanto, G.M., Rosellon, M.A.D., 2017. What determines financial inclusion in the Philippines? Evidence from a national baseline survey. *Technical Report*. PIDS Discussion Paper Series.
- Ma'ruf, A., Aryani, F., 2019. Financial inclusion and achievements of sustainable development goals (sdgs) in asean. *J. Bus. Econ. Review* 4, 147–155.
- Pandey, N., Pal, A., et al., 2020. Impact of digital surge during covid-19 pandemic: A viewpoint on research and practice. *International Journal of Information Management* 55, 102171.
- Papanek, H., Schwede, L., 1988. Women are good with money: earning and managing in an indonesian city. *Economic and political weekly* , WS73–WS84.
- Phan, H.P., 2019. Women's access to resources: Matrilineal kinship, the patriarchal state and social differentiation in vietnam. *Asian Journal of Women's Studies* 25, 572–592.

- Sioson, E.P., Kim, C.J., 2019. Closing the gender gap in financial inclusion through fintech .
- Stephan, P.E., El-Ganainy, A., 2007. The entrepreneurial puzzle: explaining the gender gap. *The Journal of Technology Transfer* 32, 475–487.
- Van, L.T.H., Vo, A.T., Nguyen, N.T., Vo, D.H., 2021. Financial inclusion and economic growth: An international evidence. *Emerging Markets Finance and Trade* 57, 239–263.