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Mobile Phones and Financial Access: Evidence from the Finscope Surveys of Selected Asian Countries

Sok Heng Lay^{*†}

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Abstract

This paper assesses the impact of mobile phones on the use of formal banking services in some Asian countries. Using the FinScope Surveys of Cambodia, Laos, Myanmar, Nepal, and Thailand conducted between 2012 and 2015, the paper applies a probit model to both cross-sectional and pooled data set. The results consistently suggest that having a mobile phone increases the probability of having access to financial services. The findings also highlight the importance of education which increases the likelihood of being formally banked, while distance or time to banking infrastructure is likely to remain a significant barrier for people to access to financial services for all countries. Other factors associated with the likelihood of changes in the levels of access to financial services vary widely from country to country.

Keywords: financial access, probit model, mobile financial service, financial institutions

JEL Classification: G20, C35, O30, O16

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1 Introduction

Economic theory suggests that financial development has a significant effect on economic growth (King and Levine, 1993; Rajan and Zingales, 1998; Beck et al., 2000; Levine et al., 2000; Khan, 2001; Claessens, 2006; Demirgüç-Kunt et al., 2008). Based on this notion, developing countries have been striving for an inclusive financial system. It is convinced that having access to financial services allows individuals, particularly those living in low-income countries, to obtain funds to finance education and other forms of capital, to save money, and to use other financial products, which results in economic growth, poverty reduction, and financial stability (Beck et al., 2007; Han and Melecky, 2013; Bruhn and Love, 2014).¹ However, a number of people remain financially excluded due to various barriers such as physical access, affordability and eligibility (Beck et al., 2008). The extent that access to finance and available range of services is limited, with up to about 2 billion people globally remain outside the formal financial system, where more than half of the unbanked adults are from the Asia and the Pacific region (Demirgüç-Kunt et al., 2015).²

Owing to the limited financial access in the remotes areas mainly caused by low infrastructure levels in developing countries, researchers at the World Bank (WB), Consultative Group to Assist the Poor (CGAP), and International Monetary Fund (IMF) suggest banks to make uses of technology such as mobile phones for greater financial access, especially for the poor (Claessens, 2006; Mas and Kumar, 2008; He et al., 2017). Mobile phones have become useful tools in the financial system in many countries due to their potentials and a rapid expansion of mobile networks into previously un-served regions and communities in developing countries. Ouma et al. (2017) argue that the advancement of mobile technology expands financial platforms of the poor and low income earners as mobile financial services become relatively cheap, secure, reliable, and accessible. Apparently, empirical research concerning the relationship between mobile phones and financial access has undergone rapid

¹The greater uses of financial services in deposits can make the deposit funding base of banks more resilient in times of financial stress, which in turn contributes to financial stability (Han and Melecky, 2013).

²Unbanked adults account for about 625 million in South Asia, and 490 million in East Asia and the Pacific, respectively representing about 31 percent and 24 percent of the global total, according to Demirgüç-Kunt et al. (2015).

growth in recent years, particularly in the case of developing countries (see, e.g. Shem et al., 2012; Honohan and King, 2013; Jack and Suri, 2014; Ouma et al., 2017).

Shem et al. (2012), using data from the 2006 and 2009 national financial access (FinAccess) surveys, examine factors influencing financial service choices that households make in Kenya. Using a logit model, Shem et al. (2012) finds that education, access to a saving facility, availability of M-PESA services, age, group affiliations and wealth significantly affect the financial access in Kenya.³ Jack and Suri (2014) show that access to M-PESA improves risk-sharing by reducing transaction costs; thereby the consumption of user households is unaffected. Meanwhile, Honohan and King (2013) observing causes and effects of financial access in sub-Saharan Africa based on FinScope Surveys confirm that income, education, financial knowledge, and mobile banking expansion are key demand side determinants of access to formal banking. Ouma et al. (2017) seeking to establish the linkage between the adoption of mobile telephony and financial services in Africa find that the availability and usage of mobile phones to provide financial services promotes the likelihood of saving at the household level. These empirical works clearly suggest that mobile phones have potential to make the unbanked access and effectively use financial services. However, to the best knowledge of the author, most of these studies have mainly focused on countries in Africa, while less is know about some countries in Asia.⁴

This study fills these gaps by examining the impact of mobile phones on the use of formal banking services in some Asian countries: Cambodia, Laos, Myanmar, Nepal, and Thailand.⁵ The study applies a probit model on both cross-section and pooled data from FinScope Surveys conducted between 2012 and 2015. The findings constantly show that having a mobile phone and achieving higher level of education increase the likelihood of making formal use of financial services, while the longer hours traveling to the nearest bank or financial institution's facilities has a negative and significant relationship with the access to financial services. The results are significant for both

³M-PESA is a mobile phone-based money transfer launched in 2007 in Kenya.

⁴Despite recently observing the determinants of financial inclusion in Asia, Fungáčová and Weill (2016) do not include the impact of mobile phones in their studies.

⁵The selected countries are based on the availability of data from the FinsScope Surveys, conducted by FinMark Trust, in Asia. Tambunlertchai (2017) recently investigates the determinants of formal financial inclusion in the non-agricultural informal sector in Myanmar using the data from the FimScope survey. However, the impact of mobile phones were not included in the study.

cross-sectional and pooled data analyses. Meanwhile, the cross-sectional data analysis show that other factors associated with the likelihood of changes in the levels of access to financial services vary widely from country to country.

The rest of the paper is organized as follow. Section 2 presents the applied methodology. Section 3 summarizes the data used in this study, while the derived results and related discussion are presented in Section 4. Section 5 provides conclusion.

2 Methodology

The study aims at examining the impact of mobile phones on an individual's use of formal banking services. Following Grimes et al. (2010) and Honohan and King (2013), this paper adopts probit model to analyze the determinants of the access to financial services in some Asian countries. The model specification is written in the following general form:

$$Banked_i = f(MOBILE_i, DEM_i, SOC_i, REG_i) \quad (1)$$

The dependent variable, *Banked*, is a binary outcome variable which equals to 1 if an individual is currently using or have used formal banking services, and equals to 0 otherwise. *MOBILE_i* is the independent variable of interest indicating whether an individual owns a mobile phone. Other factors that might affect the use of formal banking services at the individual level include demographics (*DEM_i*), socioeconomic status (*SOC_i*), and region (*REG_i*). The demographic variables include age, gender, marital status, and education. The socioeconomic variables include employment status, monthly income, dummy variable for receiving income in cash. Individual-level regional variables consist of urban dummy, time to bank, plain dummy.

Widely used in applied econometric work, probit models are binary classification models where the dependent variable is binary, and the models are estimated by Maximum Likelihood method, quantify the probability of an individual belonging to the group under study. Suppose that the decision of a household or individual to use formal financial services, y^* , is determined

by a set of exogenous variables x' , the relationship can be written as:

$$y_i^* = x_i' \beta + u_i \quad (2)$$

where β is a row vector of parameters and x_i' is the column vector. u_i is the error term which is normally distributed with mean 0 and variance 1. While y_i^* is unobservable, the discrete choice made by the individual, y_i can be observed according to the following choice rule:

$$\begin{cases} y_i = 1 & \text{if } y_i^* > 0 \\ y_i = 0 & \text{if } y_i^* \leq 0, \end{cases} \quad (3)$$

From equation (3), if y_i^* is greater than y_i , a household is formally banked. However, since y_i is not observable either, the assumption that it is normally distributed with the same mean and variance is required. Hence, it is possible to estimate β to obtain information on y_i^* .

$$P_i = P(y_i = 1|x') = P(y_i \leq y_i^*) = P(Z_i \leq \beta x_i') = F(\beta x_i') \quad (4)$$

where F is the cumulative distribution function of a normal variable and Z is a standard normal variable with mean 0 and variance σ^2 .⁶ Model (4) can be estimated using Maximum Likelihood. Under the zero conditional mean error assumption, equation (2) implies that:

$$E(y^* = 1|x') = E(x' \beta = 1|x') + E(u = 1|x') = x' \beta \quad (5)$$

The marginal index effects are the partial effects of each explanatory variable on the probit index function $x_i' \beta$. For the binary explanatory variables, the marginal effects is the difference in the predicted probability when the variable equals 0 and 1, i.e. $x_{1i}' \beta - x_{0i}' \beta$. If explanatory variables are continuous, the marginal index effects are the partial derivatives of regression function (5) with respect to the individual regressors. Those are the slope coefficients β . Since $E(y_i^* = 1|x_i') = x_i' \beta$, marginal effects are similarly interpreted as those

⁶ $F = (\frac{1}{\sqrt{2\pi}}) \int_{-\infty}^{\beta x_i'} e^{-z^2/2} dz$

obtained in linear regression models. In other words, coefficient represents the change in the probability of using formal financial service when $x_j \in \{x'\}$, all other things being equal.

3 Data

Individual level data is taken from the FinScope Surveys of Cambodia, Laos, Myanmar, Nepal, and Thailand conducted between 2012 and 2015. The objectives of the Finscope surveys are to measure and profile the levels of access to financial services by all adults. The surveys have been conducted in 26 countries (5 in Aisa) by FinMark Trust using broadly similar stratified multistage random sampling with a national representative sample adults aged 18 years and older. The data set includes 3,150 individuals for Cambodia; 2,040 for Laos; 5,100 for Myanmar; 4,014 for Nepal; and 5,990 for Thailand. The surveys records details about respondents' personal characteristics and the usage of financial products, and services providers. The FinScope surveys contain questions that ask people how they source their income, and how they manage their financial lives. The questions asked may vary from country to country given the different product and provider ranges and cultural settings. However, the questionnaire is standardized, so that the information is quite enough to allow for cross-country comparison. Table 1 provides the summary statistics for all the individual level variables and overall sample used in this paper.

The dependent variable *Banked* is a binary variable defined as those with personal access to formal financial products from formal financial institutions. In the Finscope surveys, respondents are asked whether they used to have, or currently use or have up to 30 different financial products. Each financial product has either formal or informal characteristics. To get rid of some of the marginal cases, this study follow the definition of formal bank products used in Honohan and King (2012).⁷ For the investigative sample, individuals accessing to formal financial services account for 24.3 percent, 27.5 percent,

⁷Products that determine formally Banked status includes savings book/savings account, debit card/ATM card, credit card, cash card (bank), personal loan account, home loan, vehicle loan, current/cheque account, special savings account/fix term deposit, foreign currency account, government bond, debentures, bank account outside the country, bank overdraft, internet/online banking, cell phone banking.

3.0 percent, 32.6 percent, and 83.9 percent for Cambodia, Laos, Myanmar, Nepal and Thailand, respectively.⁸ The overall sample mean for *Banked* is 38.2 percent. The independent variable *Mobile* is a dummy variable which is equal to 1 if a respondents are asked whether they currently own a mobile phone. About 61.5 percent of the survey respondents own mobile phones for all countries.

The survey also includes a series of questions about demographics, i.e. *Age* (age in years), *Female* (gender), and *Married* (marital status). *Age* is defined as the number of years of respondents aged 18 and above, and squared age (Age^2) is generated in order to consider possible non-linearity in the relation between age and the access to formal banking services. The average age for the overall sample is 43 years. For gender and marital status, 57.7 percent of the respondents are female and 67.5 percent are married. In the Finscope survey, education variable is standardized on a scale of 1-8 from "no formal education" to "tertiary education and above". For the convenience in the probit regression, the levels of education are group into four binary measures: less than primary education (*NoPrimary*), completed primary education (*Primary*), completed secondary education (*Secondary*), and completed tertiary education (*Tertiary*). The dummy for "less than primary education" is omitted to avoid perfect collinearity.

With respect to individual socioeconomic status, the survey collected information on the respondent's employment status (*Employed*), household income (*Income*), and income received in cash (*Inc_Cash*). The employment status is measured by *Employed* which is equal to 1 if the respondents are full-time, part-time, or self-employed workers. The dummy variable *Inc_Cash* is equal to 1 if respondents receive most of their income in cash. Overall sample means for these two variables are 75.5 percent and 64.2 percent, respectively. Personal total monthly income is reported in local currency unit. In order to allow quite a degree of cross-country comparison, the personal total monthly income is converted into US Dollars based on the average exchange rate quoted from the World Development Indicators of the World Bank. Then, the income is transformed with a logarithm.

⁸This shows that Myanmar has the least access to financial services among these countries. The mean value of 3.0 percent is similar to the estimate of financial inclusion index by Sarma (2016) using multidimensional data at macro level. Furthermore, Turnell (2014) contends that the financial sector in Myanmar is relatively small and less developed compared with its neighboring countries.

Table 1: Summary Statistics

Countries	Variables	Obs.	Mean	SD	Min	Max
Cambodia	<i>Banked</i>	3,150	0.243	0.429	0	1
	<i>Mobile</i>	3,150	0.687	0.464	0	1
	<i>Age</i>	3,150	43.7	15.0	18	97
	<i>Female</i>	3,150	0.625	0.484	0	1
	<i>Married</i>	3,150	0.750	0.433	0	1
	<i>NoPrimary</i>	3,150	0.170	0.376	0	1
	<i>Primary</i>	3,150	0.474	0.499	0	1
	<i>Secondary</i>	3,150	0.327	0.469	0	1
	<i>Tertiary</i>	3,150	0.029	0.168	0	1
	<i>Employed</i>	3,150	0.802	0.399	0	1
	<i>Income</i>	3,150	4.685	1.132	0.899	11.521
	<i>Inc_Cash</i>	3,150	0.743	0.437	0	1
	<i>Urban</i>	3,150	0.298	0.458	0	1
	<i>TimetoBank</i>	3,150	3.409	1.407	1	8
<i>Plain</i>	3,150	0.492	0.500	0	1	
Laos	<i>Banked</i>	2,040	0.275	0.447	0	1
	<i>Mobile</i>	2,040	0.684	0.465	0	1
	<i>Age</i>	2,040	40.5	13.7	18	112
	<i>Female</i>	2,040	0.469	0.499	0	1
	<i>Married</i>	2,040	0.107	0.309	0	1
	<i>NoPrimary</i>	2,040	0.173	0.378	0	1
	<i>Primary</i>	2,040	0.361	0.480	0	1
	<i>Secondary</i>	2,040	0.340	0.474	0	1
	<i>Tertiary</i>	2,040	0.060	0.238	0	1
	<i>Employed</i>	2,040	0.919	0.273	0	1
	<i>Income</i>	2,040	4.666	1.213	0.217	10.621
	<i>Inc_Cash</i>	2,040	0.847	0.360	0	1
	<i>Urban</i>	2,040	0.325	0.468	0	1
	<i>TimetoBank</i>	2,040	3.944	1.724	0	1
<i>Plain</i>	2,040	0.581	0.493	0	1	
Myanmar	<i>Banked</i>	5,100	0.030	0.172	0	1
	<i>Mobile</i>	5,100	0.211	0.408	0	1
	<i>Age</i>	5,100	43.9	15.0	18	98
	<i>Female</i>	5,100	0.590	0.492	0	1
	<i>Married</i>	5,100	0.775	0.418	0	1
	<i>Primary</i>	5,100	0.349	0.477	0	1
	<i>NoPrimary</i>	5,100	0.311	0.463	0	1
	<i>Secondary</i>	5,100	0.289	0.453	0	1
	<i>Tertiary</i>	5,100	0.051	0.221	0	1
	<i>Employed</i>	5,100	0.676	0.468	0	1
	<i>Income</i>	5,100	4.721	0.695	1.678	9.279
	<i>Inc_Cash</i>	5,100	0.616	0.486	0	1
	<i>Urban</i>	5,100	0.245	0.430	0	1
	<i>TimetoBank</i>	5,100	4.839	1.643	1	8
<i>Plain</i>	5,100	0.333	0.471	0	1	

Table 1 – continued from previous page

Countries	Variables	Obs.	Mean	SD	Min	Max
Nepal	<i>Banked</i>	4,014	0.326	0.469	0	1
	<i>Mobile</i>	4,014	0.661	0.474	0	1
	<i>Age</i>	4,014	39.9	15.5	18	97
	<i>Female</i>	4,014	0.586	0.493	0	1
	<i>Married</i>	4,014	0.823	0.382	0	1
	<i>NoPrimary</i>	4,014	0.425	0.494	0	1
	<i>Primary</i>	4,014	0.156	0.363	0	1
	<i>Secondary</i>	4,014	0.417	0.493	0	1
	<i>Tertiary</i>	4,014	0.002	0.042	0	1
	<i>Employed</i>	4,014	0.710	0.454	0	1
	<i>Income</i>	4,014	3.958	1.141	0.025	8.542
	<i>Inc_Cash</i>	4,014	0.615	0.487	0	1
	<i>Urban</i>	4,014	0.798	0.401	0	1
	<i>TimetoBank</i>	4,014	4.739	2.028	1	8
<i>Plain</i>	4,014	0.460	0.498	0	1	
Thailand	<i>Banked</i>	5,856	0.839	0.367	0	1
	<i>Mobile</i>	5,856	0.874	0.332	0	1
	<i>Age</i>	5,856	47.0	16.0	18	103
	<i>Female</i>	5,856	0.572	0.495	0	1
	<i>Married</i>	5,856	0.645	0.478	0	1
	<i>NoPrimary</i>	5,856	0.174	0.379	0	1
	<i>Primary</i>	5,856	0.379	0.485	0	1
	<i>Secondary</i>	5,856	0.324	0.468	0	1
	<i>Tertiary</i>	5,856	0.123	0.328	0	1
	<i>Employed</i>	5,856	0.773	0.419	0	1
	<i>Income</i>	5,856	5.997	1.421	2.778	12.681
	<i>Inc_Cash</i>	5,856	0.559	0.497	0	1
	<i>Urban</i>	5,856	0.591	0.492	0	1
	<i>TimetoBank</i>	5,856	2.942	0.982	1	6
<i>Plain</i>	5,856	0.398	0.489	0	1	
All countries	<i>Banked</i>	20,160	0.382	0.486	0	1
	<i>Mobile</i>	20,160	0.615	0.487	0	1
	<i>Age</i>	20,160	43.6	15.5	18	112
	<i>Female</i>	20,160	0.577	0.494	0	1
	<i>Married</i>	20,160	0.675	0.468	0	1
	<i>NoPrimary</i>	20,160	0.258	0.438	0	1
	<i>Primary</i>	20,160	0.340	0.474	0	1
	<i>Secondary</i>	20,160	0.336	0.472	0	1
	<i>Tertiary</i>	20,160	0.060	0.237	0	1
	<i>Employed</i>	20,160	0.755	0.430	0	1
	<i>Income</i>	20,160	4.993	1.360	0.025	12.681
	<i>Inc_Cash</i>	20,160	0.642	0.479	0	1
	<i>Urban</i>	20,160	0.472	0.499	0	1
	<i>TimetoBank</i>	20,160	3.938	1.741	1	8
<i>Plain</i>	20,160	0.427	0.495	0	1	

In terms of geographical region, two dummy variables, namely, *Urban* and *Plain*, are constructed using the individual's current home location and region location, respectively. About 47.2 percent of the survey respondents live in urban environment, while 42.7 percent live in plain region. *TimetoBank* is a category variable representing duration that it typically take the respondent to get from their to the nearest bank branch. The high the value, the longer the distance from home to the nearest financial infrastructure. The country and district dummy variables are generated, but they are not reported here in order to save space.

4 Empirical Results

The empirical results are based on the FinScope Surveys of Cambodia, Laos, Myanmar, Nepal, and Thailand conducted between 2012 and 2015. This paper employs a probit model to assess the impact of mobile phones on the use of formal banking services. The probit model is applied on the data of each country and the pooled data of all countries in the sample. Table 2 displays the marginal effects, the change in the probability of an individual making formal use of banking services for an infinitesimal change in each independent, continuous variable, or discrete change for binary or other discrete variables, by country. In general, owning a mobile phone and being educated increases the probability of an individual accessing banking services, while distance or time to banking infrastructure remains a significant barrier for people to access to financial services. However, the extent of the roles played by other factors such as demographics, socioeconomic status, behavior, and region, varies by country.

Mobile phones play an important role in fostering the access to financial services in the five countries. The country-level analysis shows significant effect of an individual owning a mobile phone on the probability of the formal use of banking services, which is significantly positive although coefficients vary from country to country. In Cambodia, Laos, Myanmar, Nepal, and Thailand, the results show that having a mobile phone increases the probability of making formal use of banking services by 4.8 percent, 9.3 percent, 2.7 percent, 10.6 percent, and 10.4 percent, respectively. Meanwhile, individual characteristics have a significant relation with being formally banked. Regarding the demo-

graphic variables, *Age* has a nonlinear relation with the use of financial services in all countries with a notable exception of Laos and Myanmar. The effect of *Age* is positive and Age^2 is negative, suggesting that older people are more likely to use formal banking services, but this obtains only up to a certain age. The non-linear relationship between age and the use of formal financial services is in line with the conclusion of Allen et al. (2016) in their worldwide study and Honohan and King (2013) in their regional study.

The impact of gender is confirmed as an important correlate of financial access in certain countries. The results shows that women are more likely to report using formal banking services in Laos and Nepal with the probability of 5.1 percent and 8.1 percent, respectively. However, gender is not statistically significantly related to the access of financial services in three countries (Cambodia, Myanmar, Thailand). Meanwhile, the likelihood of owning an account is unlikely among married individuals in all countries with the exception of Cambodia. The dummy variable for married is significantly positive only in Cambodia, which suggests that individuals who are married are more likely to be formally banked than those who are not.

Education is positively associated with having formal bank accounts. In accordance with expectations, the dummy variables for primary education, secondary education, and tertiary education are significantly related to financial access. In general, the results suggest that the higher levels of education an individual achieved increases the likelihood of making formal use of banking services. For instance, the probit estimates for Cambodia reveal that those who have completed primary education increase the likelihood of being formally banked by 9.4 percent compared with those with less than primary education or no education. The likelihood increases to 13.4 percent for those completed secondary education, and 49.3 percent for those completed tertiary education. In addition, the probit estimates for Laos, Myanmar, Nepal, and Thailand have similar patterns as the probability of being formally banked increases with an increase in education level of an individual, although coefficients for each country vary. In other words, the dummy variables for primary, secondary and tertiary education are significantly positive in all other countries with a larger coefficient for secondary and tertiary education. These results confirmed the idea that education plays a role in making a choice about using banking services.

Regarding the socioeconomic variables, *Employed* has a significant positive sign, confirming the idea that a full-time, part-time or self-employed worker is more likely to use a bank account to manage earnings. The coefficients are highly significant for all countries except Myanmar. The *Employed* coefficients are quite similar in three countries; namely Cambodia, Laos, and Nepal; with a respective likelihood of being formally banked by 13.8 percent, 13.8 percent, and 12.8 percent for individuals being employed compared to those who are not. The coefficients in these three countries are lower than that of Thailand (23.2 percent), suggesting that workers in higher-income countries are more likely to use formal banking services.⁹ Given that the lack of bank account was believed to be prevalent for low-income or unemployed individuals, the log of income variable was included in the model. The *Income* variable was expected to be positively related to *Banked*. The results suggest that an increase in income by 1 percent raises the probability of being formally banked by 2.4 percent, 7.4 percent, 8.0 percent, and 1.4 percent for Cambodia, Laos, Nepal, and Thailand respectively. The coefficients are highly significant at 1 percent level. In contrast, the *Income* coefficient for Myanmar is insignificant. Furthermore, to capture payment behavior, *Inc_Cash* was included into the model. *Inc_Cash* dummy is equal to 1 if individual's income received in the form of cash, and 0 otherwise. Overall, the *Inc_Cash* coefficients are significantly negative for all countries except Myanmar. The findings confirm that heavy cash usage reduces the use of banking services.

To account for potential regional differences, variables capturing the places the individual currently lived were taken into account. In this study, the probit model includes variables such as *Urban*, *TimetoBank*, *Plain*. Cambodia and Laos are the only countries in the sample that record a positive and significant relationship between urban dwelling and the use of formal banking services, indicating that individuals living in an urban environment are more likely to use formal banking services. Yet, the opposite results is achieved in Nepal, where *Urban* coefficient is negative indicating that individual living an urban environment is less likely to use formal banking services.¹⁰ There is no statistical evidence for Myanmar and Thailand. For distance or time to

⁹Cambodia, Laos and Myanmar were classified as lower-middle-income economies, where Nepal was listed in low-income-economy, and Thailand was categorized as upper-middle-income economy, according to the the World Bank classifies in 2016.

¹⁰In a similar fashion, Honohan and King (2013) also find a negative relationship between *Urban* and *Banked* in their empirical study for the case of Botswana.

the nearest bank branch or other financial institutions, the opposite result is achieved. Time to bank is negatively related to the use of financial services in all countries as the longer hours traveling to the nearest bank or other financial institution discourage individuals not to use financial services. Furthermore, to account for the geographical location, *Plain* dummy variable for individual living in the plain region is controlled. The results suggest that *Plain* is not statistically significantly related to financial status for all countries with a notable exception of Myanmar. This implies that individuals living in plain area is more likely to increase the use of financial services by 4.4 percent compared to those living in hilly, coastal or other areas in Myanmar. This could be mainly due to the poor infrastructure in other regions rather the plain one.

In the next step of the analysis, the probit regressions were applied on the pooled data set for all countries. The results are presented in Table 3, which reports the marginal effects. The results of the model without country or district controls are presented in column (1). Columns (2) and (3) report the results of a model with country controls, and columns (4) and (5) detail the results of a model with district controls. For robustness test, columns (2) and (4) exclude socioeconomic and geographical variables. In this analysis, the main results are based on the probit regression reported in columns (3) and (5). Given that the coefficients in these two regressions are almost identical, the coefficients can be interchangeably interpreted. Reading from column (5), the importance of mobile phones and access to financial services is confirmed. This is consistent with findings using the individual country studies (see Table 2). The results suggest that having a mobile phone increases the probability of being banked by 7.8 percent.

The results from the pooled regression in relation to age are broadly confirmed in the country-level regressions. There is a nonlinear relation between age and being formally banked. Meanwhile, being female and married is associated with an increase in the likelihood of making formal use of banking services by 1.2 percent and 2.4 percent, respectively. In addition, the pooled-data analysis in relation to education confirms these country-level results. The findings reveal that those who have completed primary education increase their chances of having access to financial services by 6.3 percent compared to those with less than primary education, while 13.4 percent for those with completed secondary education, and 26.7 percent for those with completed tertiary education. In line with the findings of Honohan and King (2013), education,

Table 2: Results of the probit model by country

Variables	Marginal Effects				
	Cambodia	Laos	Myanmar	Nepal	Thailand
<i>Mobile</i>	0.048** (0.0221)	0.093*** (0.0291)	0.027*** (0.0066)	0.106*** (0.0206)	0.104*** (0.0119)
<i>Age</i>	0.024*** (0.0041)	0.006 (0.0054)	0.002 (0.0011)	0.023*** (0.0032)	0.011*** (0.0016)
<i>Age</i> ²	-0.0003*** (0.0000)	-0.00005 (.00006)	-0.000 (0.0000)	-0.0002*** (0.00003)	-0.00008*** (0.00001)
<i>Female</i>	-0.022 (0.0183)	0.051** (0.0225)	-0.009 (0.0057)	0.081*** (0.0183)	0.014 (0.0093)
<i>Married</i>	0.060*** (0.0224)	0.024 (0.0434)	0.001 (0.0063)	0.031 (0.0230)	0.011 (0.0102)
<i>Primary</i>	0.114*** (0.0296)	0.130*** (0.0369)	0.015* (0.0083)	0.083*** (0.0253)	0.035*** (0.0118)
<i>Secondary</i>	0.169*** (0.0322)	0.195*** (0.0373)	0.024*** (0.0090)	0.243*** (0.0212)	0.147*** (0.0151)
<i>Tertiary</i>	0.521*** (0.0573)	0.279*** (0.0543)	0.062*** (0.0113)	— —	0.349*** (0.0437)
<i>Employed</i>	0.138** (0.0429)	0.138** (0.0625)	0.016 (0.0161)	0.128*** (0.0302)	0.232*** (0.0220)
<i>Income</i>	0.024*** (0.0085)	0.074*** (0.0104)	0.002 (0.0037)	0.080*** (0.0080)	0.014*** (0.0034)
<i>Inc_Cash</i>	-0.139*** (0.0364)	-0.149*** (0.0417)	0.000 (0.0154)	-0.080*** (0.0270)	-0.204*** (0.0204)
<i>Urban</i>	0.152*** (0.0451)	0.061** (0.0277)	0.000 (0.0082)	-0.054** (0.0229)	0.006 (0.0103)
<i>TimetoBank</i>	-0.023** (0.0092)	-0.020** (0.0088)	-0.008*** (0.0023)	-0.028*** (0.0055)	-0.019*** (0.0052)
<i>Plain</i>	-0.068 (0.1414)	-0.003 (0.0223)	0.044** (0.0224)	0.050 (0.1054)	-0.008 (.0109)
Observations	2,223	1,417	4,393	2,740	5,626
District Controls	YES	YES	YES	YES	YES
Log-Lik Function	-1,041.387	-694.157	-527.732	-1,389.248	-2,026.654
Log-Lik Intercept	-1,336.185	-888.696	-670.606	-1,795.255	-2, 461.676
McFadden's R^2	0.221	0.219	0.213	0.226	0.177

Notes: The standard errors are reported in the parentheses. The symbols ***, **, * mean that the coefficient is statistically different from zero, respectively, at the 1%, 5%, and 10% level. District controls involve a series of district dummies at the district level.

particularly the highly-educated group, plays a key role in accelerating the use of financial services among individuals in developing countries.

In a similar fashion to the country-level analyses, the employed workers are more likely to be formally banked by 12 percent. The *Employed* coefficient is highly significant at 1 percent significance level. In the meantime, the results show that a 1 percent increase in monthly personal income increases the chances of being banked by 2.3 percent, and heavy reliance on cash for income decreases the probability of being banked 10.2 percent. *Urban* coefficient is statistically insignificant, implying that individual living in urban versus rural area does not affect the likelihood of being formally banked. Unlike the cross-country analyses, urban dwellers in Cambodia and Laos are more more likely to access to financial services. *TimetoBank* variable is negatively and significantly related to access to financial as service when country or district level controls are included. The coefficients are identical. However, there is a contrasting evidence for the *Plain* variable. When country level controls are included, the coefficient is positive; but it becomes negative when district level controls are included. As a result, it is difficult to conclude whether plain region is associated with the access to financial services.

As measures of goodness of fit, McFadden R^2 values are used to evaluate the model and their measures are reported at the bottom of Tables 2 and 3. In practice, the goodness-of-fit based on the traditional R^2 measures from OLS may not be appropriate; therefore, McFadden (1979) proposes ρ^2 (McFadden R^2) measure in the maximum likelihood estimation. Given that the value of McFadden's R^2 is considerably lower than those of the R^2 index, the value of McFadden's R^2 between 0.2 and 0.4 presents an excellent fit (McFadden, 1979). In the cross-sectional study, the values of McFadden's R^2 as shown in Table 2 are quite appropriate. Although the value of McFadden's R^2 for probit model of Thailand is low than the range, McFadden's R^2 of 0.177 is likely not a terrible model. Similar the values of McFadden's R^2 for the pooled data analyses (Table 3) are quite appropriate.

Overall, the empirical findings in this paper underline the importance of mobile phones and education that tend to induce the usage of financial services, while poor infrastructure is likely to discourage people from access to formal banking services for all countries in the sample. In terms of policy implications, policies that have potential to boost the access to financial services

Table 3: Results of the probit model all countries

Variables	Marginal Effects				
	(1)	(2)	(3)	(4)	(5)
<i>Mobile</i>	0.247*** (0.0065)	0.082*** (0.0064)	0.073*** (0.0064)	0.085*** (0.0065)	0.078*** (0.0066)
<i>Age</i>	0.001 (.0011)	0.010*** (0.0009)	0.010*** (0.0009)	0.010*** (0.0009)	0.010*** (0.0009)
<i>Age</i> ²	0.00003** (0.00001)	-0.00008*** (0.0000)	-0.00008*** (0.0000)	-0.00008*** (0.0000)	-0.00008*** (0.0000)
<i>Female</i>	0.013** (0.0062)	0.016*** (0.0053)	0.012** (0.0053)	0.016*** (0.0053)	0.012** (0.0053)
<i>Married</i>	0.004 (0.0066)	0.017*** (0.0063)	0.022*** (0.0064)	0.020*** (0.0063)	0.024*** (0.0064)
<i>Primary</i>	0.044*** (0.0084)	0.062*** (0.0073)	0.060*** (0.0073)	0.068*** (0.0076)	0.063*** (.0077)
<i>Secondary</i>	0.070*** (0.0091)	0.153*** (0.0076)	0.134*** (0.0078)	0.152*** (0.0078)	0.134*** (0.0080)
<i>Tertiary</i>	0.124*** (0.0151)	0.310*** (0.0142)	0.270*** (0.0148)	0.303*** (0.0145)	0.267*** (0.0150)
<i>Employed</i>	0.222*** (0.0115)		0.119*** (0.0105)		0.120*** (0.0107)
<i>Income</i>	0.067*** (0.0024)		0.024*** (0.0023)		0.023*** (0.0023)
<i>Inc_Cash</i>	-0.204*** (0.0100)		-0.102*** (0.0092)		-0.102*** (0.0094)
<i>Urban</i>	0.047*** (0.0063)		-0.004 (0.0056)		-0.003 (0.0061)
<i>TimetoBank</i>	-0.048*** (0.0020)		-0.022*** (0.0018)		-0.022*** (0.0019)
<i>Plain</i>	-0.010 (0.0062)		0.017*** (0.0053)		-0.023** (0.0108)
Observations	17,492	17,945	17,492	17,610	17,162
Country Controls		YES	YES		
District Controls				YES	YES
Log-Lik Function	-8,289.403	-6,559.469	-6,292.251	-6,212.778	-5,973.525
Log-Lik Intercept	-11,804.460	-12,044.861	-11,804.460	-11,860.198	-11,618.636
McFadden's R^2	0.298	0.455	0.467	0.476	0.486

Notes: The standard errors are reported in the parentheses. The symbols ***, **, * mean that the coefficient is statistically different from zero, respectively, at the 1%, 5%, and 10% level. Country or district controls involve a series of country or district dummies at the country or district levels, respectively.

should be promoted. Firstly, policies to promote the Information and Communication Technology (ICT), i.e. mobile phones, should be encouraged. As mobile phone is one of the powerful tools in the ICT, to overcome the financial infrastructure gap, its diffusion has the potential to boost the access to financial services. In this regards, the development of mobile banking should be prioritized, and investment in this area should be encouraged in order to assure the cost effectiveness of the financial services available to both the poor and non-poor. However, mobile banking should be cautiously monitored under a legal framework that could address all possible challenges such as cyber-security or online crime.

Secondly, one notable result is that education is an important factor in explaining individual's choice in terms of influencing the likelihood of owning a bank account. In this context, policies towards increasing enrollment at all educational levels is the long-term objectives. Because primary and secondary education will reach a larger population than tertiary education, promoting financial literacy through the formal educational programs, especially from the primary education, seems to be the wiser investment. In addition, enhancing financial literacy among population is more advantageous given that individuals in developing countries may not be well-aware of financial system. This could get the un-banked to be more connected to the economic and financial system. In this regards, financial literacy through the ICT could be more effective. As the use of smart phones prevails, developing applications that allow people to understand basic financial concepts , could result in the improved financial behavior.

Thirdly, the banking or financial operations in the rural and remote areas should be encouraged because the infrastructure in the developing Asian countries remains a significant barrier to access to financial services. Given rural households remain the largest un-served market for financial services due to the lack of infrastructure (communications, electricity, transport), policy-makers should impose policies towards building sustainable rural finance institutions. These policies should provide support for and foster innovative programs and projects that allow financial services to reach the rural communities and promote sound rural financial infrastructure. However, the proposed policies require a strong commitment and participation from all stakeholders.

5 Conclusion

This paper assesses the impact of mobile phones on the use of formal banking services in some Asian countries based on the FinScope Surveys conducted by FinMark Trust between 2012 and 2015. Using the survey data for Cambodia, Laos, Myanmar, Nepal, and Thailand, the paper applies a probit model to both cross-sectional and pooled data set.

The empirical analyses provide several insightful results. First, the findings consistently suggest that having a mobile phone increases the probability of having access to financial services despite varying coefficients from country to country. The coefficients are statistically significant in both country-level and pooled data analyses, suggesting the robustness of model specification. In this regards, mobile phones play an important role in fostering the access to financial services in the five countries. Second, education has a significant impact on the likelihood of being formally banked in both country-level and pooled data analyses. The higher levels of education an individual achieved increases the likelihood of making formal use of financial services although coefficients for each country vary. The findings are consistent with those of Honohan and King (2013). Third, using “time to bank” as a measure of distance to financial services, the results show a negative and significant relationship with the access to financial services. This means that the longer hours traveling to the nearest bank or financial institution’s facilities discourage individuals not to use financial services given that infrastructure in the rural poor developing countries remains a significant barrier to access to financial services.

Meanwhile, the findings reveal that other factors associated with the likelihood of changes in the levels of access to financial services vary widely from country to country. *Age* has a nonlinear relation with the use of financial services in Cambodia, Nepal and Thailand; and this findings are in line with the conclusion of Allen et al. (2016) and Honohan and King (2013). Women are more likely to report using formal banking services only in Laos and Nepal, while the likelihood of owning an account is unlikely among married individuals in all countries with the exception of Cambodia. In addition, except for Myanmar, a full-time, part-time or self-employed worker is more likely to use a bank account to manage earnings in all countries. An increase in income raises the likelihood being formally banked, but receiving income in cash reduces the

usage of banking services significantly. Cambodia and Laos are the only countries in the sample that record a positive and significant relationship between urban dwelling and the use of formal banking services, while living in plain region increases the likelihood of being formally banked only in Myanmar.

Despite the appropriateness of the model specifications and empirical analyses, it is not possible to have a paper that is without limitations. Since the data availability for FinScope survey in Asia is available for only five countries, it is not possible to have a large pooled data set. Furthermore, the questionnaires of the survey does not contain questions asking whether respondents chooses to self-exclude themselves from using formal bank accounts, given the availability of financial products in their region locations. Meanwhile, the survey was conducted in different years, making it a bit difficult for cross-country comparison.

References

- Allen, F., Demirgüç-Kunt, A., Klapper, L., and Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation*, 27:1–30.
- Beck, T., Demirgüç-Kunt, A., and Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth*, 12(1):27–49.
- Beck, T., Demirgüç-Kunt, A., and Martinez Peria, M. S. (2008). Banking services for everyone? Barriers to bank access and use around the world. *World Bank Economic Review*, 22(3):397–430.
- Beck, T., Levine, R., and Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, 58(12):261–300. Special Issue on International Corporate Governance.
- Bruhn, M. and Love, I. (2014). The real impact of improved access to finance: Evidence from Mexico. *The Journal of Finance*, 69(3):1347–1376.
- Claessens, S. (2006). Access to financial services: A review of the issues and public policy objectives. *World Bank Research Observer*, 21(2):207–240.

- Demirgüç-Kunt, A., Beck, T., and Honohan, P. (2008). *Finance for All?: Policies and Pitfalls in Expanding Access*. Policy Research Reports. The World Bank.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., and van Oudheusden, P. (2015). The global finindex database 2014: measuring financial inclusion around the world. Policy Research Working Paper Series 7255, The World Bank.
- Fungáčová, Z. and Weill, L. (2016). Determinants of financial inclusion in Asia. In Gopalan, S. and Kikuchi, T., editors, *Financial Inclusion in Asia: Issues and Policy Concerns*, pages 35–57. Palgrave Macmillan UK, London.
- Grimes, P. W., Rorgers, K. E., and Smith, R. C. (2010). High school economic education and access to financial services. *Journal of Consumer Affairs*, 44(2):317–335.
- Han, R. and Melecky, M. (2013). Financial inclusion for financial stability: Access to bank deposits and the growth of deposits in the global financial crisis. *World Bank Policy Research Working Papers*, 6577.
- He, D., Leckow, R., Haksar, V., Mancini-Griffoli, T., Jenkinson, N., Kashima, M., Khiaonarong, T., Rochon, C., and Tourpe, H. (2017). Fintech and financial services : Initial considerations. *IMF Staff Discussion Note*, SDN/17/05.
- Honohan, P. and King, M. (2012). Cause and effect of financial access: Cross-country evidence from the FinScope surveys. IIS Discussion Paper 399.
- Honohan, P. and King, M. (2013). Cause and effect of financial access: Cross-country evidence from the FinScope surveys. In Cull, R., Demirgüç-Kunt, A., and Morduch, J., editors, *Banking the World: Empirical Foundations of Financial Inclusion*, pages 45–84. MIT Press.
- Jack, W. and Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya’s mobile money revolution. *American Economic Review*, 104(1):183–223.
- Khan, A. (2001). Financial development and economic growth. *Macroeconomic Dynamics*, 5:413–433.
- King, R. G. and Levine, R. (1993). Finance, entrepreneurship and growth. *Journal of Monetary Economics*, 32(3):513–542.

- Levine, R., Loayza, N., and Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46(1):31–77.
- Mas, I. and Kumar, K. (2008). Banking on mobiles: Why, how, for whom? *Consultative Group to Assist the Poor (CGAP)*, (48).
- McFadden, D. (1979). Quantitative methods for analyzing travel behaviour on individuals: Some recent developments. In Hensher, D. A. and Stopher, P. R., editors, *Behavioural Travel Modelling*. Croom Helm.
- Ouma, S. A., Odongo, T. M., and Were, M. (2017). Mobile financial services and financial inclusion: Is it a boon for savings mobilization? *Review of Development Finance*, 7(1):29–35.
- Rajan, R. G. and Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, 88(3):559–586.
- Sarma, M. (2016). Measuring financial inclusion using multidimensional data. *World Economics*, 17(1):15–40.
- Shem, A. O., Misati, R., and Njoroge, L. (2012). Factors driving usage of financial services from different financial access strands in Kenya. *Savings and Development*, 36(1):71–89.
- Tambunlertchai, K. (2017). Financial inclusion in Myanmar: What factors determine access to saving and credit products for informal sector workers? *Southeast Asian Journal of Economics*, 5(1):77–107.
- Turnell, S. (2014). Banking and financial regulation and reform in Myanmar. *Journal of Southeast Asian Economies*, 31(2):225–240.