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The Poverty-Reducing Effects of Financial Inclusion: Evidence from Cambodia

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Abstract*:* This study analyses the effects of financial inclusion on poverty in terms of household income per capita in Cambodia, with data from the FinScope Survey carried out in 2015. The analysis describes the effects via financial literacy, accounting for endogenous selection bias resulting from unobserved confounders and for structural differences between users and non-users of financial services in terms of income functions. The findings suggest that the use of financial services is very likely to make a great contribution to reducing household budget deficits and poverty if the users, female in particular, have at least basic financial knowledge.

Keywords: Financial inclusion, poverty, Cambodia

JEL Code: G20, I32, O16

1. Introduction

Financial inclusion, defined as access to and use of services offered by financial institutions, is a main goal of economic development via financial development, and accordingly has been argued to serve as a key policy tool for achieving the Sustainable Development Goals (SDGs) (Klapper, El-Zoghbi, and Hess, 2016). The intended effects of financial deepening on economic growth, income inequality and poverty alleviation have been evidenced in many studies (Levine, Loayza, and Beck, 2000; Beck, Demirguc-Kunt, and Peria, 2007). Nonetheless, less evidence has been provided on the effects of financial inclusion on inclusive growth and poverty, even though previous studies have made marginal efforts to address this (Demirguc-Kunt, Klapper, and Singer, 2017). Although financial inclusion is likely beneficial to economic development, poverty alleviation in particular, three strands of literature have come to different and controversial conclusions.

On the positive side, financial inclusion, through microcredit for needy households, is likely to fight poverty (see, for example, Karlan and Zinman, 2010; Imai, Arun and Annim, 2010; Imai and Azam, 2012; Asad, Issam, and Imai, 2014; Rahman, Luo and Minjuan, 2014; Kulb, Hennink, Kiiti and Mutinda, 2015; Akotey and Adjasi, 2016). It has been found to increase household income (Burgess and Pande, 2005; Swamy, 2014), create jobs (Bruhn and Love, 2014), and increase expenditures (Dupas and Robinson, 2013) and savings (Brune, Giné, Goldberg, and Yang, 2016). Access to such financial services as microcredit can minimise households' socio-economic risk through empowering women, relaxing credit constraints, acquiring needed inputs and necessary assets, and helping them in a timely manner to meet certain unexpected expenditures (Kulb, Hennink, Kiiti, and Mutinda, 2015; Akotey and Adjasi, 2016). Furthermore, it allows the poor to take control of their lives and avoid less desirable factory jobs and insecure wage labour (Bornstein, 1996) by bankrolling microbusinesses, raising household income, and smoothing household consumption (Seng, 2018b). Such a pro-poor mission is underpinned by the success of Yunus's Grameen Bank in Bangladesh. These findings confirm that financial inclusion can produce welfare-enhancing effects,

extending beyond its benefits in the financial realm to the economy (Grohmann, Klühs, and Menkhoff, 2018).

On the negative side, microcredit offered by microfinance institutions (MFIs) is likely to trap needy borrowers into a vicious cycle of poverty and has even weakened rather than empowered women (see, for example, Maldonado and González-Vega, 2008; Bateman, 2010; Schicks, 2013; Ganle, Afriyie and Segbefia, 2015; Seng, 2018a and 2018b). In between, some studies have questioned the pro-poor effects of financial inclusion and have argued that financial services, especially credit, should be used with caution (see, for example, Bello, 2006; Banerjee et al., 2009; Duvendack and Palmer, 2012).

The empirical evidence on the intended effects of financial development on needy households has drawn recent studies' attention to the determinants of financial inclusion (see, for example, Zins and Weill, 2016; Ouma, Odongo, and Were, 2017; Ghosh and Vinod, 2017; Masino and Niño-Zarazúa, 2020; Grohmann et al., 2018). Ghosh and Vinod (2017) and Grohmann et al. (2018) provided evidence that financial literacy has roles to play in promoting financial inclusion. Nonetheless, the most recent evidence on the unwanted effects of financial services still questions the pro-poor effects of financial development, in Cambodia in particular (see, for example, Bylander, 2015; Bateman, 2017; Seng, 2018a and 2018b). However, these studies do not account for financial literacy in their empirical model analysis, even while attributing the undesirable effects to borrowers' limited financial literacy. In particular, Seng (2018a and 2018b) argued that the borrowers' limited financial knowledge is very likely to constrain the pro-poor development of microfinance in Cambodia. These studies make room for others on the poverty-reducing effects of financial development, a priori revealing that financial literacy is very likely to promote pro-poor financial inclusion in developing countries such as Cambodia.

To bridge this study gap, the current study analyses the effects of financial inclusion on poverty in terms of household income per capita, taking financial literacy into account. To accomplish this, the analysis uses an endogenous switching model by households' financial literacy status, with data from the 2015 global FinScope survey on Cambodia. The endogenous switching model addresses

the endogeneity of the use of financial services, accounting not only for selection bias arising from unobserved factors determining both the decisions to use financial services and household income per capita, but also for the inherent differences between the users and non-users in terms of income functions.

A complementary analysis also investigates the effects on household budget deficits with an endogenous switching probit (ESP) model. The study concludes that the use of financial services is very likely to reduce household budget deficits and poverty if the users have at least basic financial knowledge. Although over these last 2 decades Cambodia's financial sector has developed remarkably,[3] with arguments that it has made a tremendous contribution to economic growth and household welfare, the empirical evidence is still limited.

The remainder of the study is structured as follows. Section 2 presents an overview of financial inclusion in Cambodia. Section 3 reviews relevant literature. Section 4 describes the analytical framework. Section 5 reports data and descriptive analysis. Section 6 presents the estimated results, and the final section concludes the study.

## 2.   Overview of Financial Inclusion in Cambodia

Over the past 2 decades, Cambodia has achieved remarkably rapid growth in banking, particularly microfinance. From 1997 to 2011, the sector had a leading role in Cambodia's economy, especially in the rural communities (Bylander, 2015). The government has made efforts to promote the sector's growth, aiming at contributing to socio-economic development and poverty reduction (Seng, 2018a and 2018b). Cambodia's banking sector started with microfinance in the early 1990s, emerging from not-for-profit microcredit projects supported by international donors and nongovernmental organisations (NGOs). Microfinance was developed to create jobs for demobilised soldiers and fill the non-existent banking sector. In 2017, in the banking sector, there were 39 commercial banks, 15 specialised banks,

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[1.] Bangladesh is the highest MFI-penetrated economy, with a rate of 25% followed by Bosnia Herzegovina (15%), Mongolia (15%), Cambodia (13%), and Nicaragua (11%) (Gonzalez, 2010; Seng, 2018a and 2018b).

seven microfinance deposit institutions (MDIs), 69 MFIs, 313 rural credit institutions, 11 leasing companies, 15 third-party processors, one credit bureau, six representatives offices, and 2,476 money changers (National Bank of Cambodia [NBC], 2017).

Cambodia's financial inclusion has been promoted with a focus on access to credit and savings accounts, payment instruments, and payment services. According to the Financial Stability Review published by the NBC in 2019, the credit to businesses as a percentage of gross domestic product increased from approximately 29% in 2012 to 58.3% in 2018, while the credit to individuals increased from approximately 15.5% in 2012 to 56.5% in 2018. However, the credit to businesses as a percentage of the total had a declining trend from approximately 62% in 2012 to 45% in 2018, while the credit to individuals had an increasing trend from approximately 38% in 2012 to 55% in 2018.

Figure 1. Total Deposit and Loan (2010–2017) (in KR billions)
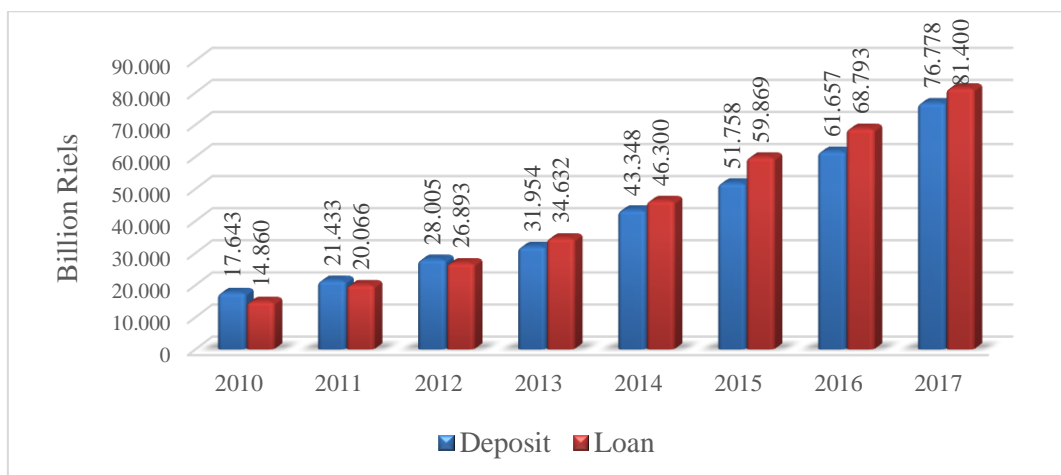
Source: National Bank of Cambodia (2017).

Furthermore, Figure 1 suggests that the total amount of deposits at banks and MDIs increased remarkably from approximately KR17.64 trillion in 2010 to KR76.78 trillion in 2017, while the total amount of loans offered by banks, MDIs and MFIs also increased from approximately KR14.86 trillion in 2010 to KR81.40 trillion in 2017. Of note, from 2013 to 2017, the amount of deposits each year was smaller than that of loans. This trend suggests that deposit and loan growth is likely inclusive. This is illustrated by Figure 2, with the number of borrowers increasing

from 1,264,423 in 2010 to 2,698,216 in 2017 and the number of depositors increasing from 1,211,915 in 2010 to 4,529,288 in 2017.

With this inclusiveness, people living in rural areas have easier access to financial services, epitomised by increased credit for income-generating activities (Cambodia Socio-Economic Survey, 2017). The rural credit offered by MFIs contributes to the expansion of cultivated land, enhancing agricultural production and living standards (Eliste and Zorya, 2015). Furthermore, the extension of MFI services benefited 3,878,618 Cambodians, or nearly five people per household (CMA, 2014). Arguably, this is attributable to Cambodian needy households being able to access credit. Although there has been an increasing number of households included in financial development, high credit costs and financial illiteracy are still challenging many borrowers and other household users of financial services, in particular those living in rural locales. Limited financial technology (fintech), such as mobile money for payments, improves household access to financial services at low transaction costs. In this context, an empirical study by Seng (2017) suggested that mobile money is likely to promote household access to MFI credit for non-agricultural investment, but to reduce the credit for non-productive purposes.

Figure 2. Number of Borrowers and Depositors (2010–2017)
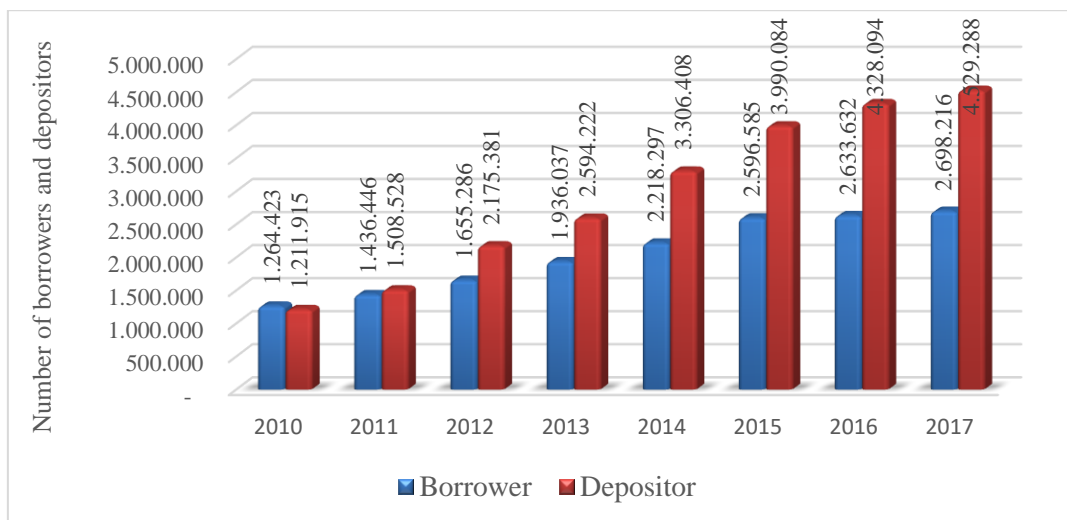
Source: National Bank of Cambodia (2017).

To promote financial inclusion, the NBC prioritises the following: access to credit for small and medium-sized enterprises; savings; access to small insurance services; payment systems; increasing the number of financial regulators; client protection; and financial literacy (NBC, 2018). As far as financial literacy is concerned, basic financial courses such as some calculations, are included in the education curriculum for high schools, and the NBC generates other advertisements oriented to the general public. In addition, the NBC enhances financial technology by developing relevant regulations and human resources. With the development of financial technology, the NBC introduced e-payment, so-called 'Bakong' using blockchain technology, allowing for the use of digital currency in both Khmer riels and US dollars (NBC, 2018).

3. Literature Review

The positive effect of finance on poverty reduction has been documented at both the macro and micro levels. Several studies (see, for example, Deininger and Squire, 1998; White and Anderson, 2001; Ravallion, 2001; Dollar and Kraay, 2002; Bourguignon, 2003) found that economies with higher levels of financial development achieve faster poverty alleviation. Financial services that allow individuals access to formal savings instruments can augment a country's net savings (Aportela, 1999; Ashraf, Gons, Karlan, and Yin, 2010). Limited access to financial services can plunge many people into the poverty trap (Galor and Zeira, 1993; Banerjee and Newman, 1994; Aghion and Bolton, 1997; Beck, Demirguc-Kunt, and Peria, 2007). Although there are data limitations at the micro level and methodological challenges, for instance, in addressing sample selection bias related to the use of financial services or controlling for unobservable confounders regarding users' characteristics, there are various studies on quantifying the effects of access to microcredit on poverty alleviation.

However, micro-level empirical studies produced inconclusive results with very controversial conclusions; while some confirm poverty-reducing effects (see, for example, Karlan and Zinman, 2010; Imai, Arun and Annim, 2010; Imai and Azam, 2012; Asad, Issam, and Imai, 2014; Rahman, Luo and Minjuan, 2014; Kulb,

Hennink, Kiiti and Mutinda, 2015; Akotey and Adjasi, 2016), others debunk them (see, for example, Maldonado and González-Vega, 2008; Bateman, 2010; Schicks, 2013; Ganle, Afriyie and Segbefia, 2015; Seng, 2018a and 2018b). In between, some studies showed mixed effects on poverty reduction; for example, in northeast Thailand, affluent borrowers, in particular the members of the village committee, are very likely to gain welfare benefits from microcredit outreach, while rank-and-file members are unlikely to do so (Coleman, 2006). Other mixed effects are also found in the Philippines (Kondo, Orbeta, Dingcong, and Infantado, 2008) and in Ghana (Ganle et al., 2015).

Alam (2012) analysed the impacts of gender-based returns to credit on intra-household resource allocation in rural Bangladesh by dealing with endogeneity of microcredit use with an instrumental variable method. The findings illustrate that female borrowers allocate household earnings more efficiently, indicating that microcredit empowers women. Imai and Azam (2012) and Asad et al. (2015) used a propensity score matching (PSM) approach to quantify the poverty-reducing effects of MFI credit at the household level in Bangladesh and in Pakistan, respectively, with the results confirming the pro-poor effects. Rahman et al. (2014) analysed the welfare-enhancing effects of microloans on households by adopting a difference-in-difference (DID) approach, with the data collected from the Shaanxi province of China. Their findings illustrated the intended effects. Swamy (2014) examined the economic effects of financial inclusion on poor households by gender in India by using the DID method with panel ordinary least squares (OLS) and generalised methods of moments with standard errors for a robust analysis. The findings suggest that financial inclusion reduces poverty in terms of household income per capita, with the income-increasing effects on women being significantly higher than those on men. However, the PSM approach cannot control for such unobservable characteristics as borrowers' wealth, entrepreneurial skills, motivation, and so forth that potentially determine both the use of credit and the outcome variables (Seng, 2015), while the DID procedure may still be subject to such biases as reverse causality and omitted variable bias.

Other empirical studies tried to address endogeneity regarding the household uptake of microloans by using a treatment effects method (see, for example, Imai et al., 2010) to evaluate the pro-poor effects of MFI credit for productive purposes in India and Heckman sample selection approach (see, for example, Akotey and Adjasi, 2016) to access the effects of microcredit in Ghana. These studies confirm the favourable effects. Still, these econometric approaches fail to account for structural differences between borrowers and non-borrowers in terms of outcome functions because of the assumptions that the functions differ only by constant terms (Seng, 2018a), yielding bias and inconsistent results.

Other strands of studies confirmed unfavourable effects of poverty alleviation. For instance, Coleman's 2006 studies illustrate that northeast Thailand's microcredit, used in non-productive ways, traps women in a vicious cycle of high-interest debts. The failure of financial inclusion in terms of access to credit to break women's poverty cycle results from women generally making low return on investment and repaying loans by borrowing from other micro-lenders, bearing a heavy debt burden (Seng, 2018a). Schicks's 2013 analysis of Ghana's credit market shows that 30% of Accra borrowers from the major microlenders experience over-indebtedness, while over-indebtedness puts a large burden on many borrowers in Kosovo (Pytkowska and Spannuth, 2012). Furthermore, the most influential studies by Seng (2018a and 2018b) suggest that microcredit is very likely to worsen borrowers' household welfare and even trap the needy borrowers in a vicious cycle of poverty in Cambodia. These findings indicate that MFIs are seemingly drifting away from their social mission, raising concerns over the poverty-reducing effects of financial inclusion in terms of access to credit. Although Seng's 2018 studies did not account for the effects of financial literacy in their empirical model, they nonetheless argued that the borrowers' limited financial knowledge is very likely to constrain the pro-poor development of microfinance in Cambodia.

These studies make room for further studies on the poverty-reducing effects of financial development, a priori revealing that financial literacy is very likely to promote pro-poor financial inclusion in developing countries such as Cambodia. In addition, Cole, Sampson, and Zia (2011), and Grohmann, Klühs, and Menkhoff

(2018) found that higher financial literacy substitutes for financial infrastructure and promotes more financial inclusion, possibly reinforcing the desirable effects of financial services on household welfare and poverty reduction. Nevertheless, some studies (see, for example, Bello, 2006; Banerjee et al., 2009; Karlan and Zinman, 2009; Duvendack and Palmer Jones, 2012) cautioned against considering financial inclusion in terms of microloans as a tool to fight poverty, while still advocating it, arguing that it should be used with 'cautious optimism'.

4.   Analytical framework

This study analyses the effects of financial inclusion in terms of uptake of financial services on household poverty in terms of household income per capita, accounting for financial literacy, with the endogenous switching model to control for endogeneity of household use of financial services. The endogenous switching model controls for selection bias arising from unobservable factors affecting both the use of financial services and household income and for inherent differences between the users and non-users in terms of income functions. The ESP model is complementarily adopted to quantify the effects of financial inclusion on household budget deficits.

Household decision to use financial services and its implications

Following Seng (2018a and 2018b), household decisions to use financial services and their implications in terms of income per capita can be modelled within a two-stage framework, with the first corresponding to the decision and the second corresponding to its implications. A model for household *i*'s decision regarding the use of financial services is built on the empirical models proposed by Imai and Azam (2012), and Akotey and Adjasi (2016), and examined with a probit model estimation (Seng, 2018a and 2018b). Thus, the probit model can be specified in the following latent variable:

$$T_i^* = \alpha Z_i + u_i \quad \text{with} \quad T_i = \begin{cases} 1 & \text{if} \quad T_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \tag{7.1}$$

where T_i is a binary variable that is equal to 1, if household i takes up financial services, and zero otherwise. Z_i is covariates correlated with the decision to use or not to use financial services. α is parameter to be estimated. u_i is error term that is assumed to be normally distributed, that is, $u_i \sim N(0,1)$.

The simplest approach to quantify the effects of financial inclusion would be to use the dummy variable T_i in a household income function as a regressor and then to apply an OLS estimation. In this case, a commonly used model in the literature on impact evaluation is expressed as follows:

$$Y_i = \beta_1 X_i + \beta_2 T_i + \varepsilon_i \qquad\qquad (7.2)$$

where Y_i is household i's per capita income; X_i is controlling factors expected to determine the income; T_i is a dummy for the use of financial services; and β_2 is the coefficient capturing the effects of financial inclusion on the income. However, this procedure is very likely to yield biased and inconsistent estimates because the decisions to use financial services are potentially endogenous. That is, the decisions can be voluntarily made and may be based on individual households' self-selection (Seng, 2018b). Standard treatment effects models can be used to account for this self-selection bias and other unobservable confounders. Nevertheless, these models cannot control for the inherent differences between the household users and non-users in terms of income functions due to the assumption that the functions differ by only constant terms. The failure to address this structural issue may still yield biased and inconsistent estimates of the effects. Addressing the inherent differences, the PSM approach can be adopted. However, this approach fails to account for unobservable confounders, more possibly still producing biased and inconsistent estimates. Thus, to provide reliable empirical evidence, a proper empirical approach should be adopted.

Endogenous switching model

Following Seng (2018a and 2018b), to deal with the early-mentioned econometric challenges, the endogenous switching model that treats the

household's financial choices (use vs. do not use the services) as regimes is employed and specified as follows:[4]

$$T_i^* = \alpha Z_i + u_i$$

(7.3)

$$\text{Regime} \qquad 1: \qquad y_{1i} = \beta_1 X_{1i} + \varepsilon_{1i} \quad \text{if } T_i = 1$$

(7.4a)

$$\text{Regime} \qquad 2: \qquad y_{2i} = \beta_2 X_{2i} + \varepsilon_{2i} \quad \text{if } T_i = 0$$

(7.4b)

where T_i^* is the latent variable for household i's use of financial services, with T_i being its observable counterpart. α, β_{1i} and β_{2i} are vectors of parameters to be estimated. y_i represents household income per capita in regimes 1 (users) and 2 (non-users). X_i represents a vector of exogenous factors expected to determine the household income. The set of variables Z_i can overlap X_i; nonetheless, to properly identify the selection equation, at least one variable that directly affects the decisions to use financial services, but would indirectly influence the income through the use of financial services, is used as an instrument restriction. Imai et al. (2010) used the availability of formal banks in the village as a possible instrument to evaluate the effects of microcredit on household poverty with the treatment-effects model. Due to the unavailability of such information in the current study's dataset, a dummy for income proof documents (the variable is 1 if the household has income proof documents and 0 otherwise) and a dummy for family books are used as an identification restriction.

In addition to other documents such as land title, when borrowers apply for loans, the income proof documents and family books are also required by banks and MFIs in Cambodia. Moreover, the family book is also required for opening a bank account to identify savers. Thus, the study hypothesises that their availability influences the decisions regarding the use of financial services, but does not determine the income. Following Di Falco, Veronesi, and Yesuf (2011), a simple

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[2.] Following the previous studies (see, for example, Chang and Mishra, 2008; Akotey and Adjasi, 2016; Seng, 2018a and 2018b), the selection model is estimated with a probit model describing the household decision to use financial services.

rejection falsification test is also conducted to justify admissibility, that is, instruments are valid if they affect the financial decision but not the non-users' household income per capita. Table A7.2 of the appendix confirms that the availability of income proof documents and family books jointly influence the decisions to use financial services, but do not affect household income per capita; thus, they can be used as valid instruments. Finally, the error terms u_i, ε_{1i} and ε_{2i} are assumed to be correlated and jointly normally distributed with a zero mean vector and covariance matrix; i.e. $(v_i, \varepsilon_{1i}, \varepsilon_{2i}) \sim N(0, cov(.))$:

$$cov(v_i, \varepsilon_{1i}, \varepsilon_{2i}) = \begin{pmatrix} \sigma_{v_i}^2 & \sigma_{\varepsilon_{1i}v_i} & \sigma_{\varepsilon_{2i}v_i} \\ \sigma_{\varepsilon_{1i}v_i} & \sigma_{\varepsilon_{1i}}^2 & . \\ \sigma_{\varepsilon_{2i}v_i} & . & \sigma_{\varepsilon_{2i}}^2 \end{pmatrix} \tag{7.5}$$

where $var(v_i) = \sigma_{v_i}^2$, $var(\varepsilon_{1i}) = \sigma_{\varepsilon_{1i}}^2$, $var(\varepsilon_{2i}) = \sigma_{\varepsilon_{2i}}^2$, $cov(\varepsilon_{1i}, \varepsilon_{2i}) = \sigma_{\varepsilon_{1i}\varepsilon_{2i}}$, $cov(\varepsilon_{1i}, v_i) = \sigma_{\varepsilon_{1i}v_i}$, and $cov(\varepsilon_{2i}, v_i) = \sigma_{\varepsilon_{2i}v_i}$. The variance $\sigma_{v_i}^2$ equals 1, as α is estimated only up to a scale factor, and the covariance $\sigma_{\varepsilon_{1i}\varepsilon_{2i}}$ is not defined as y_{1i} and y_{2i} are not observed together (Maddala, 1986).

The correlation between the error term v_i of Equation (7.3) and the error terms ε_{1i} and ε_{2i} of Equations (7.4a) and (7.4b) suggests potential unobservable effects. Thus, the expected values of ε_{1i} and ε_{2i} conditional on regime selection would be nonzero and can be derived as follows:

$$E(\varepsilon_{1i}|T_i = 1, X_{1i}) = E(\varepsilon_{1i}|v_i > -\alpha Z_i) = \sigma_{\varepsilon_{1i}v_i}\frac{\phi(Z_i\alpha)}{\Phi(Z_i\alpha)} = \sigma_{\varepsilon_{1i}v_i}\lambda_{1i} \tag{6a}$$

$$E(\varepsilon_{2i}|T_i = 0, X_{2i}) = E(\varepsilon_{2i}|v_i \le -\alpha Z_i) = \sigma_{\varepsilon_{2i}v_i}\frac{-\phi(Z_i\alpha)}{1-\Phi(Z_i\alpha)} = \sigma_{\varepsilon_{2i}v_i}\lambda_{2i} \tag{6b}$$

where ϕ is the standard normal probability density function; and Φ is the cumulative distribution function of the standard normal distribution. λ_{1i} and λ_{2i} are the Inverse Mills Ratios (IMRs) predicted at $Z_i\alpha$ for household users and non-users, respectively (Greene, 2008). Then, one can conduct an endogeneity test with the estimated covariances $\sigma_{\varepsilon_{1i}v_i}$ and $\sigma_{\varepsilon_{2i}v_i}$. Either significantly nonzero $\sigma_{\varepsilon_{1i}v_i}$ or $\sigma_{\varepsilon_{2i}v_i}$ rejects the null hypothesis that there is no sample selection bias,

confirming the endogenous switching (Maddala, 1986). Thus, a test for significant coefficients of the correlation between ε_{1i} and v_i $(\rho_{\varepsilon_{1i}v_i} = \sigma_{\varepsilon_{1i}v_i}/\sigma_{\varepsilon_{1i}}\sigma_{v_i})$ and between ε_{2i} and v_i $(\rho_{\varepsilon_{2i}v_i} = \sigma_{\varepsilon_{2i}v_i}/\sigma_{\varepsilon_{2i}}\sigma_{v_i})$ is necessarily carried out (Lokshin and Sajaia, 2004).

A full information maximum likelihood (FIML) approach is the most efficient at estimating the endogenous switching model (Lokshin and Sajaia, 2004). The FIML approach simultaneously estimates the selection and outcome equations with the availability of income proof documents restricting the model identification, then provides consistent standard errors. Given the assumption that the error terms follow trivariate normal distribution, the logarithmic likelihood function for the system of Equations (3) and (4a and 4b) can be:

$$\ln L_i = \sum T_i \left[\ln \phi \left(\frac{\varepsilon_{1i}}{\sigma_{\varepsilon_{1i}}} \right) - \ln \sigma_{\varepsilon_{1i}} + \ln \Phi(\theta_{1i}) \right]$$
$$+ (1 - T_i) \left[\ln \phi \left(\frac{\varepsilon_{2i}}{\sigma_{\varepsilon_{2i}}} \right) - \ln \sigma_{\varepsilon_{2i}} + \ln(1 - \Phi(\theta_{2i})) \right] \qquad (7.6)$$

where $\theta_{ji} = \frac{Z_i\alpha + \rho_j\varepsilon_{ji}/\sigma_j}{\sqrt{1-\rho_j^2}}, j = 1, 2$, with ρ_j being the correlation between the error term v_i of Equation (3) and the error terms ε_{1i} and ε_{2i} of Equations (4a) and (4b), respectively. That is, ρ_1 and ρ_2 are equal to $\rho_{\varepsilon_{1i}v_i} = \sigma_{\varepsilon_{1i}v_i}/\sigma_{\varepsilon_{1i}}\sigma_{v_i}$ and $\rho_{\varepsilon_{2i}v_i} = \sigma_{\varepsilon_{2i}v_i}/\sigma_{\varepsilon_{2i}}\sigma_{v_i}$, respectively.

Furthermore, the pro-poor effects of financial inclusion can be estimated by comparing the users' conditional expected income derived from the endogenous switching regression with the counterfactual case that the same households have not used financial services. The conditional expected income a user enjoys with characteristics *X* and *Z*, and the conditional expected income that the same user would enjoy without using financial services are derived as follows (Lokshin and Sajaia, 2004):

$$E(y_{1i}|T_i = 1, X_{1i}) = \beta_1 X_{1i} + \sigma_{\varepsilon_{1i}v_i}\lambda_{1i} \qquad (7.7a)$$
$$E(y_{2i}|T_i = 1, X_{1i}) = \beta_2 X_{1i} + \sigma_{\varepsilon_{2i}v_i}\lambda_{1i} \qquad (7.7b)$$

where $\sigma_{\varepsilon_{1i}v_i}\lambda_{1i}$ control for a sample selection arising from the fact that a user is different from others with characteristics X and Z due to unobserved confounders. Following Heckman, Tobias and Vytlacil (2001) and Di Falco et al. (2011), the effects of the treatment on the treated (TT) that accounts for all factors potentially determining the differences in income can be derived as follows:

$$TT = E(y_{1i}|T_i = 1) - E(y_{2i}|T_i = 1) = (\beta_1 - \beta_2)X_{1i} + (\sigma_{\varepsilon_{1i}v_i} - \sigma_{\varepsilon_{2i}v_i})\lambda_{1i}$$

(7.8)

The TT results from the differences in the coefficients in Equations (7a) and (7b) ($\beta_1 - \beta_2$ and $\sigma_{\varepsilon_{1i}v_i} - \sigma_{\varepsilon_{2i}v_i}$). Thus, simply comparing average household income in the user group $E(y_{1i}|T_i = 1)$ to that in the non-user group $E(y_{2i}|T_i = 0)$ would confirm a bias of the treatment effects. If a household self-selects to use or not use financial services based on comparative advantage, $\sigma_{\varepsilon_{1i}v_i} - \sigma_{\varepsilon_{2i}v_i}$ would be positive, suggesting that the use of financial services would increase household income under self-selection rather than under random assignment (Maddala, 1983).

Endogenous switching probit model

To give more insights into the potential effects of financial inclusion poverty alleviation, an analysis on the effects on household budget deficits is also conducted with the ESP model developed by Aakvik, Heckman, and Vytlacil (2005), and Lokshin and Sajaia (2011). In the model, the treatment T_i is earlier defined by Equation (3) and the outcome is a binary variable for the households' behaviours towards household budget deficits (the variable is 1 if the household runs a budget deficit and 0 if otherwise) being used as the outcome variable. The outcome equations are specified as follows:

Regime 1: $y_{1i}^* = \beta_1 X_{1i} + v_{1i}$, $y_{1i} = 1\ (y_{1i}^* > 0)$ (7.9a)

Regime 2: $y_{2i}^* = \beta_2 X_{2i} + v_{2i}$, $y_{2i} = 1\ (y_{2i}^* > 0)$ (7.9b)

Observed y_i is defined as $y_i = \begin{cases} y_{1i} & \text{if } T_i = 1 \\ y_{2i} & \text{if } T_i = 0 \end{cases}$

where y_{1i}^* and y_{2i}^* are the latent variables determining the observed binary outcomes y_{1i} and y_{2i}. X_i represents a vector of exogenous factors expected to determine the household budget deficit. β_{1i} and β_{2i} are vectors of parameters to be estimated. The error terms u_i of Equation (7.3), and v_{1i} and v_{2i} of Equations (7.9a) and (7.9b), respectively, are assumed to be correlated and jointly normally distributed with a zero mean vector and covariance matrix; i.e. $(u_i, v_{1i}, v_{2i}) \sim N(0, cov(.))$. The ESP model is also estimated with the FIML (Lokshin and Sajaia, 2011). To properly identify the selection equation, at least one variable that directly affects the decisions to use financial services, but would indirectly influence the household budget deficit through their use, is used as an instrument restriction. To justify the admissibility of the availability of income proof documents and family books being used as the instruments, the same simple rejection falsification test as in the endogenous switching model is performed. The results reported in Table A7.2 of the appendix confirms that the availability of income proof documents and family books can be used as the valid instruments. Similar to the TT derived from Equation (7.8) for the effects on household income per capita, accounting for all factors potentially affecting the differences in probability of household budget deficits, the treatment effects on the treated (TT) can be derived as follows:

$$TT = \Pr(y_{1i} = 1 | T_i = 1) - \Pr(y_{2i} = 1 | T_i = 1) \qquad (7.10)$$

The average treatment effects on the treated (ATT), for the corresponding subgroups of the sample, is commonly computed by averaging TT from Equation (7.10) which is the mean effects of the treatment on those who use financial services. In this case, the ATT can be computed as follows (Lokshin and Sajaia, 2011):

$$ATT = \frac{1}{N_T} \sum TT_i \qquad (7.11)$$

where N_T is the number of observations with $T_i = 1$ (i.e. the number of financial users). The ATT also provides the robustness check on the effects of financial inclusion on poverty in terms of household income per capita.

5. Data and variables

This section describes the source of data and main variables used in the analysis. A descriptive statistical analysis is also presented at the end of the section. The analysis is also conducted with simple statistical tests of differences in means.

Data used in the analysis

The current study uses the data from the FinScope Consumer Survey conducted in 2015. The FinScope survey was conducted by South Africa's FinMark Trust in partnership with the United Nations Capital Development Fund, Cape Town-based think tank Cenfri, as well as local partners including the NBC and the National Institute of Statistics (NIS). The survey contains household information based on a nationwide representative sample of the adult population over 18 years of age. The sampling frame and data weighting were carried out by the NIS and weighted to the NIS estimates and validated against census data and the 2013 Cambodia Inter-censal Population Survey. In the survey, the total of 3,150 household representatives over 18 years of age in both rural and urban areas were selected as the sample. Nevertheless, because some representatives did not provide full information on the variables of interest, there are some missing observations in the analysis. Adjusting for the missing observations, the final sample count is 2,693 individuals in the regression analysis.

Variables

The dependent variable in the selection equation is binary for the use of financial services, while the dependent variables in the outcome equation are the household income per capita for the endogenous switching model and the household budget deficit for the ESP model. Following Lusardi and Mitchell (2007) and Drexler et al. (2014), financial literacy in the current study is defined as an ability to understand basic financial concepts. A dummy for financial literacy (i.e.

the variable is 1 if the household understands how banks work and benefits from a saving account at banks, and 0 otherwise) is built on the availability of data in the FinScope survey.

Due to the limitations on data, following previous studies (see, for example, Imai, Arun, and Amin, 2010; Akotey and Adjasi, 2016; Seng, 2018a and 2018b), the study uses the available information such as household head characteristics, household characteristics, and means of access to information, and income proof documents as the explanatory variables in the model. The head's characteristics consist of age, gender, ethnicity, and marriage status. Following Seng (2018a and 2018b), the heads are also grouped into four categories according educational level: training, primary education, secondary education, and tertiary education. The numbers of household income generators are included to capture the effects of household characteristics. Households are also characterised by their geographical locations: Coastal area, Plain area, Plateau area, and Tonlé Sap area. The analysis also controls for rural areas, as a geographical characteristic, to capture rural household behaviour towards the decisions concerning financial services, as well as its effect on household income (see, for example, Akotey and Adjasi, 2016).

The means of communication and access to information, proxied by cell phone and email, is used to capture the effects of access to financial information on households' financial decisions. This facilitates the diffusion of information on financial services amongst households because it can serve as a tool to build social networks, and then, more likely, to induce households to use the services, and more probably in an efficient way. Of note, social networks are very likely to promote access to microfinance services (Wydick, Hayes, and Kempf, 2011). Cell phones can also be used as mobile money, which is found to promote household welfare and financial inclusion (Munyegera and Matsumoto, 2015; Ouma, Odongo, and Were, 2017). Finally, as noted, the availability of household income proof documents and a family book are also critical when applying for any financial services. Thus, they are expected to determine household income per capita indirectly through access to financial services. All these variables are summarised in Table A7.1.

Descriptive analysis

The survey suggests that approximately 61.14% of the sampled households use formal financial services, suggesting that approximately 38.86% are excluded from access to financial services. Approximately 30% of the financial users take out credit, while approximately 10% save money at formal financial institutions. Moreover, approximately 89.37% of the sampled households have at least basic financial knowledge (i.e. understanding how banks work and benefit from a savings account).[5]

Table 1. Household Characteristics by Users and Non-Users of Financial Services

Variables	Users		Non-users		Difference in Mean
	Mean	SD	Mean	SD	
Household income per capita	291,888.60	1,030,364.00	302,222.10	3,284,952.00	-10,333.52
Household budget deficit	0.507	0.500	0.518	0.500	-0.011
Financial literacy	0.898	0.302	0.886	0.317	0.012
Household head's age	44.045	13.961	43.081	16.569	0.964
Household head's ethnicity	0.944	0.230	0.957	0.204	-0.013*
Household head's gender	0.074	0.261	0.094	0.292	-0.020**
Single	0.004	0.060	0.007	0.002	-0.003
Marriage	0.459	0.498	0.455	0.498	0.004
Divorced	0.009	0.096	0.010	0.099	0.000
Widowed	0.052	0.222	0.067	0.250	-0.015**
Training	0.003	0.051	0.004	0.064	-0.001
Primary	0.241	0.428	0.292	0.455	-0.051***
Secondary	0.162	0.369	0.127	0.333	0.035***
Tertiary	0.019	0.135	0.010	0.099	0.009**
Income generators	2.469	1.287	2.368	1.233	0.101**
Cellphone	0.800	0.400	0.646	0.478	0.154***
Email	0.062	0.241	0.019	0.136	0.043***
Rural	0.676	0.467	0.741	0.438	-0.064***
Coastal	0.076	0.266	0.068	0.252	0.009
Plain	0.502	0.500	0.476	0.500	0.026*
Plateau	0.094	0.293	0.154	0.361	-0.059***

[3.] Due to the unavailability of appropriate data on financial literacy from the FinScope survey, the study constructs a proxy for financial literacy based on a question: do you understand how banks work and benefit from having a savings account at a bank?

Tonlé Sap	0.327	0.469	0.302	0.459	0.025*
Income proof	0.074	0.261	0.042	0.200	0.032***
Family book	0.909	0.287	0.883	0.320	0.025***

SD = standard deviation.
Notes: Income per capita is the monthly income in riel.
* denotes test statistic significance at 10% level.
** denotes test statistic significance at 5% level.
*** denotes test statistic significance at 1% level.
Source: Author's calculation.

The descriptive statistics summarised in Table 1 illustrate some non-significant and significant differences between household users and non-users in terms of each variable, which are supported by simple statistical tests of differences in means. For example, there are non-significant differences in per capita household income between the users, who enjoy an average household income per capita of KR291,889 (US$73), and non-users, who enjoy an average household income per capita of KR302,222 (US$76).[6] Moreover, on average, approximately 51% of the users run household budget deficits, while approximately 52% of the non-users run household budget deficits. The figures illustrate the non-significant difference between the users and the non-users in terms of household budget deficits. Nevertheless, the users and the non-users are significantly different in terms of household head's ethnicity, gender, education achievement, number of income generators, access to information and social communication, and geographical locations. Particularly, approximately 16.2% of the users are headed by a person having access to secondary school and approximately 2% by a person having access to higher education, while approximately 13% of the non-users are headed by a person having access to secondary school and approximately 1% headed by a person having access to tertiary education. These results indicate that the households headed by a secondary school person are likely to have more access to financial services.

Furthermore, on average, approximately 7.4% of the users possess income proof documents, while approximately 4.2% of the non-users have them, suggesting a significant difference between users and non-users. This simple statistical test reveals that income documents are likely to facilitate the use of financial services, in particular when households apply for credit.

[4.] The amount is converted into US dollars at the exchange rate of US$1 = KR4,000.

Table 2. Main Household Characteristics by Financial Literacy Status

	With financial literacy		Without financial literacy		Difference in Mean
	Mean	**SD**	**Mean**	**SD**	
Household income per capita	303,991.5	2,302,071	227,813.1	689,760.6	76,178.36
Use of financial services	0.615	0.487	0.585	0.493	0.029
Household budget deficit	0.520	0.500	0.439	0.497	0.081**
Household head's age	43.794	15.009	42.636	15.217	1.158
Household head's ethnicity	0.947	0.224	0.964	0.186	-0.017
Household head's gender	0.081	0.272	0.090	0.286	-0.009
Single	0.005	0.001	0.0001	0.001	0.005
Marriage	0.457	0.498	0.463	0.499	-0.006
Divorced	0.010	0.097	0.009	0.094	0.001
Widowed	0.056	0.230	0.072	0.258	-0.016
Training	0.004	0.060	0.0001	0.001	0.004
Primary	0.259	0.438	0.278	0.448	-0.018
Secondary	0.151	0.358	0.125	0.332	0.026
Tertiary	0.015	0.121	0.018	0.133	-0.003
Income generators	2.426	1.262	2.457	1.317	-0.030
Cellphone	0.742	0.438	0.725	0.447	0.017
Email	0.045	0.208	0.045	0.207	0.000
Rural	0.701	0.458	0.710	0.454	-0.010
Coastal	0.069	0.253	0.107	0.310	-0.039**
Plain	0.503	0.500	0.403	0.491	0.100***
Plateau	0.115	0.319	0.137	0.345	-0.022
Tonlé Sap	0.313	0.464	0.352	0.478	-0.039*

SD = standard deviation.
Notes: Income per capita is the monthly income in riels.
* denotes test statistic significance at 10% level.
** denotes test statistic significance at 5% level.
*** denotes test statistic significance at 1% level.
Source: Author's calculation.

Table 2 demonstrates the simple statistical test results regarding the differences between households headed by a person with financial literacy and those headed by a person without financial literacy in terms of each variable. The results suggest a non-significant difference between the groups in terms of household income per capita. However, households headed by a financially literate person enjoy an average per capita income of KR303,992 (US$76), while those headed by a financially non-literate person enjoy an average income of KR227,813 (US$57). Concerning the use of financial services, albeit non-significant, the

percentage of households headed by a financially literate person is approximately 62%, while those headed by a financially non-literate person is approximately 59%. Related to household budget deficits (spending more than earning), on average, the percentage of households headed by a financially literate person is approximately 52%, which is significantly higher than that of those headed by a financially non-literate person, with approximately 44%.

Nonetheless, the results of this simple descriptive statistical analysis do not necessarily suggest that households headed by a financially literate person are more likely to enjoy higher household income per capita and more likely to run a household budget deficit than do those headed by a financially non-literate person. This is because this simple statistical approach cannot address such issues as endogeneity of financial literacy and household decisions to use financial services. Further analyses addressing such a challenge control for financial literacy in the evaluation of the effects of financial inclusion on household income.

6.   Results and Discussion

The descriptive statistical analysis suggests the non-significant differences in household income per capita and in household budget deficit between users and non-users. The econometric analysis further quantifies the poverty-reducing effects of financial inclusion on households, controlling for endogeneity issues regarding the decision to use financial services.

Use of financial services

Table 3 reports the results of the probit model, describing the decision to use financial services, jointly estimated with the income equations by using the FIML method. The life-cycle effects of the household head on the probability of using financial services are quadratic, confirmed by the significantly positive coefficient of age and the significantly negative coefficient of the age-squared term. Similar to the previous studies by Seng (2018a and 2018b), the likelihood of using financial services increases, but starts to decrease by degrees after attaining 48 years of age. With age, the head gains more experience and has increasing economic

opportunities, becoming eager for financial services, but starts to lose by degrees the opportunities after reaching this age (Seng, 2018a and 2018b).

Table 3. Determinants of Households' Financial Uses (Simultaneously Estimated Probit[a])

Variables	Use of financial services		
	Coef.	**SE**	***P*-value**
Household head's age	7.547***	1.394	0.000
Household head's age squared	-0.977***	0.190	0.000
Household head's gender	0.041	0.152	0.785
Household head's ethnicity	-0.246**	0.114	0.030
Single	-0.354	0.393	0.368
Marriage	0.054	0.096	0.575
Divorced	0.007	0.321	0.983
Widowed	-0.086	0.178	0.630
Training	-0.610	0.426	0.152
Primary	-0.026	0.096	0.783
Secondary	0.100	0.109	0.359
Tertiary	0.157	0.284	0.579
Income generators	0.031	0.021	0.136
Cellphone	0.459***	0.061	0.000
Email	0.784***	0.158	0.000
Rural	-0.013	0.061	0.834
Coastal	0.321***	0.117	0.006
Plain	0.199**	0.081	0.015
Plateau	Dropped		
Tonlé Sap	0.245***	0.083	0.003
Income proof	0.431***	0.107	0.000
Family book	0.021	0.086	0.809
Constant	-14.600***	2.552	0.000
Observations	2,693		
Prob. $> \chi^2$	0.000		

Notes: Standard errors (SE) is robust SE.
[a] Probit model is simultaneously estimated with the income regime equations by using the FIML method reported in Table 3.
* denotes test statistic significance at 10% level.
** denotes test statistic significance at 5% level.
*** denotes test statistic significance at 1% level.
Source: Author's calculation.

Nevertheless, the significantly negative coefficient of the household head's ethnicity suggests that households headed by Khmer are less likely to use financial services. As expected, cellphone and email have significantly positive correlations with the decision to use financial services. These findings are consistent with the arguments by previous studies (see, for example, Wydick, Hayes, and Kempf, 2011; Munyegera and Matsumoto, 2015; Ouma, Odongo, and Were, 2017) that access to information and social networks facilitate microfinance services. Furthermore, households in Coastal, Plain and Tonlé Sap are likely to use more financial services offered by formal financial institutions. As expected, although the coefficient of family books is non-significant, it is positive and the coefficient of income proof documents is significantly positive, confirming that their availability is important for the use of financial services, in particular credit applications.

Household income per capita

Table 4 presents the estimates for the income equations of the endogenous switching model. The likelihood ratio test for joint independence of Equations (3)–(4b) is reported at the bottom of the table. The testing result suggests that the three equations are jointly dependent, confirmed by the significant likelihood ratio, indicating the problem of endogeneity that needs to be controlled for in the model specification of household income equations. That is, the endogeneity is caused by the presence of both observed and unobserved confounders determining the decision to use financial services and the income outcome given the decision to use the services. In this case, the endogenous switching model is appropriate to account for self-selection and inherent differences between users and non-users (Seng, 2018a and 2018b).

Table 4. Determinants of Household Income per capita

Variables	Users			Non-users		
	Coef.	SE	*P*-value	Coef.	SE	*P*-value
Household head's age	6.410***	1.856	0.001	8.819**	3.856	0.022
Household head's age squared	-0.922***	0.253	0.000	-1.250**	0.533	0.019
Household head's gender	-0.166	0.124	0.181	-0.172	0.204	0.401
Household head's ethnicity	-0.065	0.108	0.545	0.216	0.169	0.202
Single	-0.216	0.405	0.594	-0.550**	0.253	0.030
Marriage	-0.297**	0.122	0.015	-0.722***	0.194	0.000
Divorced	0.142	0.297	0.633	-0.162	0.331	0.624
Widowed	-0.214	0.169	0.205	-0.377	0.275	0.170
Training	0.814	0.806	0.313	0.462*	0.260	0.076
Primary	0.051	0.115	0.655	0.438**	0.177	0.013
Secondary	0.160	0.147	0.275	0.523**	0.226	0.021
Tertiary	0.587*	0.310	0.058	1.240**	0.513	0.016
Income generators	-0.166***	0.025	0.000	-0.151***	0.034	0.000
Cellphone	0.492***	0.078	0.000	0.406***	0.101	0.000
Email	0.522***	0.131	0.000	-0.797	0.848	0.347
Rural	-0.616***	0.068	0.000	-0.713***	0.109	0.000
Coastal	0.441***	0.128	0.001	0.185	0.149	0.214
Plain	0.022	0.092	0.813	-0.246**	0.106	0.020
Plateau	Dropped			Dropped		
Tonlé Sap	0.155*	0.090	0.084	-0.077	0.105	0.461
Constant	1.020	3.405	0.765	-3.514	6.837	0.607
$\ln \sigma_{\varepsilon_1 v}$	0.219***	0.051	0.000			
$\rho_{\varepsilon_1 v}$	0.055	0.095	0.564			
$\ln \sigma_{\varepsilon_2 v}$				0.305***	0.052	0.000
$\rho_{\varepsilon_2 v}$				-0.151	0.111	0.174
LR test of indep. Eqns.	Prob. $> \chi^2 = 0.000$					
Log pseudo-likelihood	-6,184.469					

Notes: Standard errors (SE) is robust SE. The dependent variable is the natural log of monthly household income per capita. These outcome equations are jointly estimated with the selection equation reported in Table 2 by using the FIML method with robust SE. LR = Likelihood ratio.
* denotes test statistic significance at 10% level.
** denotes test statistic significance at 5% level.
*** denotes test statistic significance at 1% level.
Source: Author's calculation.

The differences in the income equations' coefficients between users and non-users, corresponding to the structural differences across the two regimes in terms of each explanatory variable, show the presence of heterogeneity in the samples. These bring about the differences between the users and non-users in terms of income functions. For example, the household heads' tertiary educations are

significantly and positively associated with the income for both users and non-users; the coefficients' magnitudes are, however, lower for the users than those for the non-users. These results suggest that the effects of tertiary educations are greater amongst the non-users. Furthermore, the detailed results corresponding to other explanatory variables can be found in Table 4 and interpreted in a similar fashion.

Poverty-reducing effects of financial inclusion

Table 5 presents the effects of financial inclusion on poverty, with the second column corresponding to the income effects. The treatment effects (TT) are described via household head's financial literacy and gender interacted with financial literacy. The estimated results demonstrate that, for households headed by a person without financial literacy, the conditional expected income by the financial users $E(y_1|I=1)$ is KR123,399 (US$31) per month. The conditional expected income users would have enjoyed if they did not use financial services $E(y_2|I=1)$ is KR93,560 (US$23) per month. Thus, when using financial services, on average, households are likely to increase the per capita income by KR29,838 (US$7) per month. In a similar fashion, when using financial services, on average, households headed by a person with financial literacy are likely to increase the per capita income by KR30,600 (US$8) per month. These results suggest that financial users with financial literacy are much better off in terms of household income per capita than those without financial literacy. Overall, the results reveal that financial literacy is very likely to reinforce the favourable effects of financial inclusion on poverty reduction. These results support the findings by previous studies (see, for example, Cole et al., 2011; Grohmann et al., 2018). They also confirm the argument by Seng (2018a and 2018b) that the lack of financial knowledge is very likely to be an obstacle to the pro-poor growth of microfinance, and, even worse, bring about the unwanted effects of financial inclusion in Cambodia.

Taking gender into consideration, when using financial services, on average, households headed by a man without financial literacy are likely to increase the household income per capita by KR28,917 (US$7) per month, while those headed by a man with financial literacy are likely to increase the income by KR29,227 (US$7) per month. Furthermore, households headed by a woman without financial literacy are likely, when using financial services, to increase the income by KR34,314 (US$9) per month, while those with financial literacy are likely to increase the income by approximately KR42,979 (US$11). The results show that,

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regardless of financial literacy, female-headed users of financial services are very likely to gain more than male-headed users in terms of household income per capita. These results are consistent with arguments that female users of financial services allocate household incomes more efficiently (see, for example, Alam, 2012; Akotey and Adjasi, 2016). Of note, financial users headed by a woman with financial literacy are more likely to make the greatest gains from using financial services, suggesting that promoting financial inclusion and financial literacy for women is one of the best ways to lift needy households out of poverty. These findings complement both of Seng's 2018 studies that focused only on credit and did not account for gender and financial literacy in the estimation of the treatment effects of microcredit on household welfare and poverty.

Table 5. Effects of Financial Inclusion on Household Income per capita

	Income Effects	
	Mean	**SE**
Without financial literacy		
$E(y_{1i}|T=1)$	123,398.600	5,487.527
$E(y_{2i}|T=1)$	93,560.460	5,419.053
TT	29,838.140***	77,12.269
With financial literacy		
$E(y_{1i}|T=1)$	123,949.200	1,885.205
$E(y_{2i}|T=1)$	93,349.010	1,867.451
TT	30,600.140***	2,653.558
Male head without financial literacy		
$E(y_{1i}|T=1)$	125,012.800	5,820.670
$E(y_{2i}|T=1)$	96,095.590	5,915.732
TT	28,917.170***	8,299.161
Male head with financial literacy		
$E(y_{1i}|T=1)$	124,281.900	1,972.431
$E(y_{2i}|T=1)$	95,054.390	1,994.227
TT	29,227.480***	2,804.893
Female head without financial literacy		
$E(y_{1i}|T=1)$	105,239.300	14,937.650
$E(y_{2i}|T=1)$	70,925.410	8,415.328
TT	34,313.910***	17,145.000
Female head with financial literacy		
$E(y_{1i}|T=1)$	119,713.600	6,298.973
$E(y_{2i}|T=1)$	76,734.270	4,710.588
TT	42,979.310***	7,865.539

Notes: The expected values of monthly household income per capita in riels by individual households are transformed from log terms. SE = standard error, TT = treatment effects.
*** denotes test statistical significance at 1% level.
Source: Author's calculation.

Table 6 presents the household budget deficit effects of financial inclusion, with the second column being described via household head's financial literacy and gender interacted with financial literacy. The estimated results demonstrate that, when using financial services, on average, households headed by a person without financial literacy are likely to reduce the probability of running household budget deficits by approximately 26%. Similarly, when using financial services, on average, households headed by a person with financial literacy are likely to reduce the probability of running a household budget deficit by approximately 27%. These results suggest that financial users with financial literacy are likely to reduce the likelihood of household budget deficits at a greater level than do those without financial literacy. Overall, these results reveal financial literacy is very likely to help financial users mitigate the risk of household budget deficits, reinforcing the income effects of financial inclusion. The estimated results of the probit model describing the household decision to use financial services are consistent with those reported in Table 2 and are available on request. Moreover, the detailed results related to outcome equations describing the budget deficit for the users and non-users are also available on request.

Table 6. Effects of Financial Inclusion on Household Budget Deficits

	ATT		
	Male	**Female**	**Difference in ATT**
Without financial literacy	-0.116	-0.170	0.054***
	(0.005)	(0.024)	(0.017)
With financial literacy	-0.118	-0.200	0.082***
	(0.001)	(0.009)	(0.006)

ATT = average treatment effects on the treated.
*** denotes test statistical significance at 1% level. Standard errors are in parentheses.
Source: Author's calculation.

Table 6 reports the average treatment effects of financial inclusion on household budget deficits. Taking gender into account, when using financial services, on average, households headed by a man without financial literacy are likely to reduce the probability of household budget deficit by approximately 12%, while those headed by a woman without financial literacy are likely to reduce the probability by approximately 17%. Furthermore, households headed by a man with

financial literacy are likely, when using financial services, to reduce the probability by approximately 12%, while those headed by a woman with financial literacy are likely to reduce the probability by approximately 20%. The results demonstrate that, regardless of financial literacy, female-headed users of financial services are very likely to perform much better than male-headed users in terms of reducing household budget deficits. These results confirm the arguments by Alam (2012), and Akotey and Adjasi (2016) that women manage cash more efficiently. Of note, financial users headed by a woman with financial literacy are more likely to reduce the probability of a household budget deficit by the greatest level, indicating that promoting both financial inclusion and financial literacy for women is beneficial. These complementary findings provide evidence that financial literacy is likely to reinforce the poverty-alleviating effects of financial inclusion, more possibly through reducing household budget deficits.

7.   Conclusion

The empirical evidence on the beneficial effects of financial development on needy households has drawn recent studies' attention to the determinants of financial inclusion and suggests that financial literacy has roles to play in enhancing financial inclusion. While the most recent studies do not control for financial literacy in their empirical model analysis, the evidence on the unwanted socio-economic effects of financial services is still ambivalent about the poverty-alleviating effects of financial development.

This study analyses the effects of financial inclusion on poverty in terms of household income per capita via financial literacy and household gender interacted with financial literacy in Cambodia by applying the endogenous switching model to data from the FinScope Survey conducted in 2015. The endogenous switching results suggest that the use of financial services is very likely to make a great contribution to increasing household income per capita, in particular for household users headed by a woman with financial literacy. A complementary analysis was also performed to further quantify the household budget deficit effects of financial inclusion with the ESP model. The ESP results demonstrate that the use of financial

services is more likely to reduce the probability of a household budget deficit, for the users headed by a woman with financial literacy in particular. These results suggest that financial inclusion is very likely to make a great contribution to poverty reduction if the users have at least basic financial knowledge. Women with financial literacy are more likely to gain from financial inclusion. These findings are robust and consistent with the NBC's prioritised policies toward enhancing financial inclusion, giving insight into how financial inclusion can promote poverty alleviation and in particular underscoring the need for effective financial education for the current and next generations, and gender access to financial services as a strategy for sustained poverty reduction in Cambodia.

Finally, the study has its limitations as the panel data are unavailable and those used in the analysis, in particular the variable capturing financial literacy, are not ideal for estimating treatment effects. With such accurate data, this study can be improved with more appropriate instruments and financial literacy measurement to address the issues of endogeneity regarding financial services and the issues of financial literacy when estimating treatment effects. This is an opportunity for future studies when better data are available.

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Appendix

Table A1. Summary of Variables

Variables	Definition
Dependent	
Household income per capita	Natural log of monthly income per household member
Household budget deficit	= 1 if the household runs budget deficit (i.e. spending > income)
Financial inclusion	= 1 if the household uses financial services (i.e. saving and borrowing etc.)
Independent	
Household head's age	Natural log of household head age
Household head's gender	= 1 if the household head is female
Household head's ethnicity	= 1 if the household head is Khmer
Single	= 1 if the household head is single
Marriage	= 1 if the household head is married
Divorced	= 1 if the household head is devoiced
Widowed	= 1 if the household head is widowed
Training	= 1 if the household head had access to any training
Primary	= 1 if the household head had access to primary school
Secondary	= 1 if the household head had access to secondary school
Tertiary	= 1 if the household had access to higher education
Income generators	The number of household members who contribute to income generation
Cellphone	= 1 if the household communicates and access to information by cellphone
Email	= 1 if the household communicates and access to information by email
Rural	= 1 if the household lives in rural area
Coastal	= 1 if the household settles in Coastal area
Plain	= 1 if the household settles in Plain area
Plateau	= 1 if the household settles in Plateau area
Tonlé Sap	= 1 if the household settles in Tonlé Sap area
Income proof	= 1 if the household possesses income proof documents

Table A.2. Parameter Estimates—Test for Validity of the Selected Instruments

Variables	Per capita income by non-users (OLS)			Use of financial services (probit)			Budget deficit by non-users (probit)		
	Coef.	SE	*P*-value	Coef.	SE	*P*-value	Coef.	SE	*P*-value
HH's age	9.71***	2.10	0.00	9.26***	1.20	0.00	3.26*	1.65	0.05
HH's age squared	-1.37***	0.29	0.00	-1.22***	0.16	0.00	-0.43*	0.23	0.06
HH's ethnicity	0.17	0.21	0.43	-0.19*	0.11	0.08	-0.14	0.18	0.44
HH's gender	-0.17	0.27	0.52	-0.02	0.14	0.87	0.10	0.22	0.66
Single	-0.57	0.61	0.35	-0.33	0.36	0.37	-0.13	0.50	0.80
Marriage	-0.70***	0.16	0.00	0.07	0.09	0.44	0.04	0.14	0.76
Divorced	-0.13	0.48	0.79	0.25	0.27	0.37	-0.20	0.43	0.64
Widowed	-0.37	0.31	0.23	-0.01	0.17	0.94	0.05	0.26	0.85
Training	0.30	0.70	0.67	-0.54	0.43	0.21	0.91	0.67	0.18
Primary	0.41**	0.16	0.01	-0.07	0.09	0.44	-0.04	0.13	0.76
Secondary	0.52**	0.19	0.01	0.11	0.10	0.26	0.18	0.16	0.26
Tertiary	1.25**	0.54	0.02	0.12	0.22	0.59	0.15	0.39	0.71
Income generators	-0.15***	0.04	0.00	0.04*	0.02	0.05	-0.03	0.03	0.30
Cellphone	0.47***	0.10	0.00	0.43***	0.06	0.00	-0.02	0.08	0.82
Email	-0.68*	0.37	0.06	0.66***	0.14	0.00	0.14	0.28	0.62
Rural	-0.71***	0.11	0.00	-0.02	0.05	0.68	0.05	0.09	0.55
Coastal	0.22	0.20	0.26	0.09	0.10	0.38	-0.12	0.15	0.44
Plain	-0.24*	0.13	0.06	-0.03	0.05	0.54	0.03	0.09	0.77
Plateau	Dropped			-0.27***	0.08	0.00	-0.05	0.11	0.69
Tonlé sap	-0.04	0.13	0.75	Dropped					
Income proof[a]	0.29	0.21	0.17	0.43***	0.11	0.00	-0.03	0.19	0.85
Family book[a]	0.08	0.14	0.54	0.01	0.08	0.91	0.25**	0.12	0.03

	(1)			(2)			(3)		
Constant	-5.12	3.83	0.18	-17.39***	2.19	0.00	-6.15**	3.00	0.04
Observations	1031			2693			1221		
Adj. R^2	0.14								
Prob. > Chi^2					0.00				0.48
Pseudo R^2				0.06			0.01		
Log likelihood				-1979.36			-835.20		

OLS = ordinary least squares.

[a] the test for the joint effects income proof and family book under the null hypothesis: (1) for per capita income by non-users (OLS), $H_0: \lambda_1 = \lambda_2 = 0$, the critical value $F = 1.10$ and Prob. > $F = 0.33$; (2) for the use of financial services (probit), $H_0: \lambda_1 = \lambda_2 = 0$, the critical value $Chi^2 = 16.33$ and Prob. > $Chi^2 = 0.00$; and (3) for the budget deficit by non-users (probit), $H_0: \lambda_1 = \lambda_2 = 0$, the critical value $Chi^2 = 4.65$ and Prob. > $Chi^2 = 0.10$.

* denotes test statistic significance at 10% level.
** denotes test statistic significance at 5% level.
*** denotes test statistic significance at 1% level.
Source: Author's calculation.

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