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Financial Literacy, Financial Inclusion, and Savings Behavior in Laos

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Abstract: This study examines the effects of financial literacy on financial inclusion and savings behavior in Laos. Compared to previous literature, we use a broader definition of financial literacy which covers not only financial knowledge but also financial behavior and financial attitudes. We also use a new definition of financial inclusion which goes beyond the supply-side perspective to consider the consumer's perspective. To do so, we use the survey instrument designed by the Organisation for Economic Cooperation and Development International Network on Financial Education. We also used more reliable instrumental variables to investigate the effects of financial literacy on financial inclusion (and its components) and savings behavior. We find that financial literacy has statistically positive effects on both financial inclusion and savings. Moreover, the effects of financial literacy on different measures of financial inclusion vary. Our results further show that individuals with higher financial literacy scores are more likely to hold savings in both formal and informal forms than those who have lower financial literacy scores, even when we control for income and education.

Keywords: financial literacy, financial behavior, financial inclusion, household saving, Cambodia, Laos, Viet Nam

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I. INTRODUCTION

Financial inclusion is an important determinant of economic growth and poverty reduction (World Bank 2018). Households that are financially included are able to increase savings, invest in education, launch businesses, empower women, and improve health outcomes (Beck et al. 2007, Bruhn and Love 2014; Dupas and Robinson, 2013; Angelucci et al. 2013; Banerjee et al. 2015).

Financial literacy plays an important role in furthering financial inclusion according to Grohmann et al. (2018) based on data from the S&P global financial literature survey. Adetunji and David-West (2019) found that financial literacy influences savings patterns with both formal and informal financial institutions. Morgan and Trinh (2019a) similarly found that financial literacy is positively associated with financial inclusion and saving. Other studies in developing countries, too, have confirmed that better financial literacy is positively related to broader participation in financial markets, greater use of formal sources of borrowing (Klapper et al. 2013), higher voluntary saving (Landerretche and Martinez 2013), and better financial diversification (Beckmann 2013). Xu and Zia (2012) have summarized the evidence for developing economies showing that financial literacy is positively correlated with having bank accounts and insurance policies.

A number of issues have arisen in the literature regarding the relationship between financial literacy and financial inclusion. The first issue is related to the measurement of financial literacy. There are several widely used definitions of financial literacy. For example, Lusardi and Mitchell (2014) defined financial literacy as "...peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions." Recently, the Organization for Economic Cooperation and Development and the International Network on Financial Education (OECD/INFE) (2016) defined financial literacy as "... [a] combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing." Thus, this concept of financial literacy is multidimensional, reflecting not only knowledge but also skills, attitudes, and actual behavior. However, in most recent empirical studies, financial literacy is

only measured by a single dimension – financial knowledge, using the three standard questions proposed by Lusardi and Mitchell (2007).

The second issue is related to measurement of financial inclusion. OECD/INFE (2016) argued that most recent literature has examined financial inclusion from the supply side (access to services, availability of ATMs, etc.) while instead financial inclusion should be viewed from the consumption perspective. Financial inclusion should not only be related to holding of financial products but also to product awareness, active choice of products, and knowledge of alternatives to formal financial services. The current literature, however, does not have a consensus on how to measure financial inclusion.

The third issue relates to causal identification. Recent attention has increasingly turned to conducting field experiments to assess causality. However, Allen et al. (2016) expressed doubt that field experiments “conducted in a particular setting can be applied in a different setting.” This viewpoint aligns with that of Deaton (2009), Rodrik (2008), and Grohmann et al. (2018). To deal with endogeneity between financial literacy and financial inclusion using observational data, an instrumental variable approach brings credibility. However, most current studies using data collected in developing countries have either ignored the endogeneity problem or used dubious instruments.

This paper aims to deal with the above mentioned issues. Based on household data from collected in Laos using the standard survey instrument developed by the OECD/INFE, we examine the effects of financial literacy on financial inclusion and savings behavior. We construct a financial literacy score which consists of three components: financial knowledge; financial behavior; and financial attitude. Further, we construct a financial inclusion score that provides a nuanced and multi-dimensional view from the consumption perspective, is constructed. Empirically, we find that the overall measure of financial literacy has statistically significant effects on savings and financial inclusion, although this does not hold for all three components of the financial literacy score. Moreover, the effects of financial literacy on the various measures of financial inclusion are different. Our empirical results also show that individuals with higher financial literacy scores tend to save more in both formal and informal ways than those who have lower scores, even when we control for income and education.

This paper contributes to the literature in several respects. First, we extend the current literature regarding the effects of financial literacy on financial inclusion by using a more comprehensive measures of financial literacy and financial inclusion. In this aspect, this paper is close to Morgan and Trinh (2019a), which used similar financial literacy and financial inclusion measures. This paper goes beyond Morgan and Trinh (2019a) by examining the effect of

financial literacy and its components on different aspects of financial inclusion. Moreover, this study uses a more reliable set of instrumental variables than Morgan and Trinh (2019a) and other studies of developing countries to deal with potential endogeneity.

Second, this paper provides more reliable evidence of a causal relationship between financial literacy and financial inclusion. Most previous studies based on survey data from developing countries use instrumental variables that suffer from exogenous restrictions. For example, Morgan and Trinh (2019a), Fernandes et al. (2014), and Murendo and Mutsonziwa (2017) used the average financial literacy score at the commune or district level as an instrument for an individual's financial literacy. However, there are various factors that may make this instrumental variable invalid. For example, the average financial literacy score may be higher in more developed regions where people also tend to have easier access to financial inclusion. Without controlling for economic development at the district/community level, this type of instrumental variable may not be valid. In this study, we use a set of instrumental variables that are usually included in studies of developed countries, such as numerical skills and history of family shocks. We also use the average financial literacy score as an instrumental variable, but we control for the level of development at the district level.

Laos is an interesting case. In the last decade, the Laotian government has implemented numerous policies to improve financial inclusion (GIZ 2015). However, according to World Bank (2018), the country was persistently on the list of five Asian economies with the lowest levels of financial inclusion during the period 2011-2015. Furthermore, while financial inclusion in other Asian economies improved significantly, progress in the Laos seems to have been slow. To our knowledge, there is no recent study on how financial literacy could help to improve financial inclusion in economies experiencing such slow progress. This study fills this gap.

This paper is organized as follows. Section 2 discusses related literature. The data collection and empirical approach are presented in Section 3. Sections 4 and 5 present the stylized facts of financial inclusion and financial literacy in Laos, descriptive analyses, and empirical results. Conclusions and policy implications follow in Section 6.

2. LITERATURE SURVEY

Financial inclusion is considered an important vehicle to promote inclusive growth and reduce poverty. At the micro level, many studies have shown that improved financial inclusion may help to reduce poverty (Burgess and Pande, 2005), increase employment (Bruhn and Love, 2014), and raise savings (Brune et al., 2016). At the macro level, financial inclusion has a

positive impact on economic growth (Inoue and Hamori, 2016) and enhances financial stability (Han and Melecky, 2013).

A number of studies have investigated determinants of financial inclusion. Using the World Bank's Global Findex database, Demirgüç-Kunt and Klapper (2013) found that differences in income among 148 countries and among individuals within these countries influence the level of financial inclusion. Allen et al. (2016) emphasized the important role of income and education in determining ownership of a bank account and saving into a bank account based on data for 123 countries. Ghosh and Vinod (2017), using data from India, show that women are more likely to be financially excluded. Other factors that may affect financial inclusion include marital status, region within a country, bank network development, and the socio-economic factors (Davutyan and Öztürk 2016; Kumar 2013).

There is a well-developed literature linking measures of financial literacy with other economic and financial behaviors. This literature dates back to Bernheim (1995, 1998) examining the shift toward defined-contribution pension plans in the US. This area of research got a further boost after the global financial crisis of 2008–2009, which drew attention to numerous scams inflicted on individual borrowers and investors in the US and other countries. Hilgert et al. (2003) found a strong correlation between financial literacy and daily financial management skills, while other studies found that more numerate and financially literate individuals are more likely to participate in financial markets and accumulate precautionary savings (Christelis et al. 2010; van Rooij et al. 2011; and de Bassa Scheresberg 2013). The more financially savvy are also more likely to plan for retirement and in the process accumulate more wealth (Lusardi and Mitchell 2011). These results have been corroborated in a number of countries (Morgan and Trinh 2019a).

In the context of developing countries, several studies have examined the role of financial literacy on saving decisions and on financial inclusion by using either survey data or randomized controlled trials. Using cross-country data from the S&P Global Finlit survey, Grohmann et al. (2018) found that financial literacy has a positive effect on use of financial services. They also found that the positive impact of financial literacy holds across income levels and subgroups within countries defined by various characteristics. Adetunji and David-West (2019) used survey data for over 22,000 respondents in Nigeria to show that financial literacy significantly affects savings patterns within both formal and informal financial institutions. Morgan and Trinh (2019a), using a comprehensive measurement of financial literacy, found positive effects of financial literacy on financial inclusion and saving behavior in Cambodia and Vietnam. Randomized control trials in developing countries have also confirmed that higher

financial literacy is positively related to participation in financial markets, use of formal sources of borrowing (Klapper et al. 2013), voluntary savings (Landerretche and Martinez 2013), asset diversification (Beckmann 2013), and sound choice among financial products (Cohen and Nelson, 2011).

3. DATA AND METHODOLOGY

3.1 Data Collection

We used the harmonized OECD/INFE questionnaire of adult financial literacy (OECD 2015c) to ensure comparability with other studies. The questionnaire covers socio-demographic characteristics (such as gender, age, income, and occupation) of respondents as well as information related to financial literacy and financial inclusion. Financial literacy questions are designed to capture financial behavior, attitudes, and knowledge in such areas as making ends meet, long-term financial planning, and financial product selection. Further, we include questions related to the respondent's parents' education, school performance, distance from the nearest bank, household experience of financial shocks, and use of financial technology (fintech) products. We had the questionnaire translated into Lao, and the translation was checked by the Bank of Laos (BoL).¹

The survey was conducted by Indochina Research Ltd under the direction of the Asian Development Bank Institute. Data collection was carried out from June to August 2018. Multilevel stratification was used in sampling. Eight provinces out of 18 were selected, namely Vientiane Capital, Oudomxay, Luangprabang, Bolikhamxay, Khammuane, Savannakhet, Sekong, and Champasack. Within each province, we selected districts, and within each district, communes, ensuring that the sample reflected the distribution of rural and urban population. In each commune, 10 households were randomly selected. Then, in each household, an individual aged from 18 to 79 was randomly selected to respond to the survey. Overall, there were 1,000 respondents from 100 communes in 29 districts of 8 provinces/cities.² Please refer to Appendix Table A1 for sample distribution statistics.

3.2 Construction of financial inclusion and financial literacy measures

Financial inclusion goes beyond the simple supply-side perspective of services being accessible to encompass involvement from the consumer's side, following OECD/INFE (2016). By this broader definition, a financial inclusion index is based on two components: holdings of

¹ Please refer to the online supplement for the survey instrument.

² 1,000 is the minimum sample size recommended by the OECD (OECD 2015). Because 11 respondents did not report their income and/or education level, our sample for empirical analysis comprises only 989 observations.

financial products and active consumption of financial products. With regard to product holdings, measurement focuses on four financial products: (a) savings or retirement products; (b) payment products such as current account or mobile money (excluding credit cards and other types of accounts that offer payment facilities such as savings accounts); (c) insurance products; and (d) credit products, such as a credit card or mortgages. The active consumption component of financial inclusion consists of three indicators: (a) whether consumers are aware of available financial products; (b) whether they are making conscious choices among financial products; and (c) whether they have turned to family or friends to help them save money or make ends meet. Based on survey responses with respect to each of these items, the score for financial inclusion is calculated with a resulting range in values from 0 to 7. Details of the calculation are given in Appendix Table A2.

The financial literacy measure consists of three related components: financial knowledge; financial behavior; and attitudes toward financial planning.

Financial knowledge helps individuals compare financial products and services so as to make appropriate, well-informed financial decisions. A basic knowledge of financial concepts and the ability to apply numeracy skills in a financial context ensure that consumers can manage their financial affairs independently and respond appropriately to news and events that may have implications for their financial well-being. Financial knowledge can be measured both objectively through test questions and subjectively by asking respondents to rate their own literacy compared with that of their peers. Seven questions from the survey are used to compile a financial knowledge score that takes a range in values of 0 to 7. Details of the calculation are given in Appendix Table A3.

Financial behavior (or financial “savvy”) means taking (or not taking) financial actions. Some types of behavior, such as putting off bill payments, failing to plan future expenditures, or choosing financial products without shopping around, may have an adverse effect on an individual’s financial well-being. Financial behavior thus captures something different from financial knowledge, and it is important to account for this. The score is calculated from eight questions relating to household budgeting, savings, purchases, bill payment, attentiveness, goals, and borrowing, and ranges between 0 and 9.

Financial attitude is measured with three questions regarding time preference, saving, and spending. For example, one question asks whether the respondent tends “to live for today and let tomorrow take care of itself.” Financial attitude is likely to determine behavior that could lead to improved financial resilience and well-being. The resulting score ranges from 1 to 5. A higher score represents more conservative and considered behavior.

The overall score for financial literacy is the sum of the scores for financial knowledge, financial behavior, and financial attitude, and hence takes values between 1 and 21.

In our econometric analyses we convert all indicator scores (i.e., financial inclusion and its two components, and financial literacy and its three components) into z-score values by mean differencing and dividing by the standard deviation. This allows for interpretation of coefficients in terms of standard deviations.

3.3 Empirical approach

To discern the effect of financial literacy on financial inclusion, we follow Allen et al. (2016) to estimate the following equation:

$$FI_i = \gamma_0 + \gamma_1 FL_i + \gamma_2 X_i + \omega_i \quad (1)$$

where FI_i is the financial inclusion score, or the scores of its two components, or the scores of the seven individual elements; FL_i is the financial literacy score, or the scores of its three components; X_i is a vector of control variables; and ω_i is the error term.

With regard to the control variables, we follow the literature (e.g. Allen et al. 2016; Grohmann et al. 2018 and others) to control for various individual characteristics that may influence both financial inclusion and financial literacy. These variables include income, education, age, gender, employment, rural versus urban residence, distance to bank in minutes, and share of district population with income above a threshold. Three household income groups are defined by income below 2 million kip per month (75% of the median), income between 2 million and 3.5 million kip per month (up to 125% of the median), and income above 3.5 million kip per month, with income below 2 million kip per month taken as the reference group.³ Education groups are defined as some or completed primary education, some or completed secondary education, and some or completed tertiary education, with the tertiary group taken as the reference. Age groups are defined as 18-30 years, between 30 and 60 years, and over 60 years, with 18-30 years taken as the reference group. Employment status groups are defined as: (i) self-employed; (ii) paid employee; (iii) disabled (i.e., cannot work), student, homemaker,⁴ or retired; (iv) voluntarily and involuntarily unemployed; and (v) non-respondent.

Further, we examine the effects of financial literacy and its components on saving behavior using the following equation:

³ We adopt income categories consistent with the OECD/INFE survey instrument.

⁴ Due to the small number of respondents identifying as homemakers, we were not able to treat them separately.

$$Savings_i = \beta_0 + \beta_1 FL_i + X_i \beta_2 + \eta_i \quad (2)$$

where $Savings_i$ is a dummy variable, taking the value of one if the individual has held any type of savings products in the last two years and zero otherwise;⁵ and η_i is the error term.

Since there may exist reverse causality running from the outcome variables of financial inclusion and savings behavior to financial literacy (our variable of interest) as well as unobservable factors that may affect both financial inclusion and financial literacy, OLS estimation would yield biased and inconsistent results. In order to address these potential endogeneity problems, we use an instrumental variable (IV) approach making use of three instrumental variables.

For our main instrumental variable, we follow Grohmann (2018) and Grohmann et al. (2018) in using respondents' mathematical skills when they were in school. This variable takes a value of one if respondents report having been better than their classmates at mathematics in their last year of education and zero otherwise. As mathematical skill is a precondition for financial literacy, especially financial knowledge, mathematical skill and financial literacy are highly correlated. We argue that mathematical skill could only affect financial inclusion through financial literacy since financial understanding, not mathematical understanding, will directly affect one's decision to save or to open an account.

Our second instrumental variable involves whether the respondents' parents or siblings experienced any financial shocks in the last year. This type of instrumental variable was used by van Rooji et al. (2011). While the financial condition of siblings and parents is not under the control of respondents, witnessing financial problems in the family may provide strong motivation to acquire financial knowledge (van Rooij et al., 2011) and make changes in financial behavior or financial attitude.⁶

Finally, for our third instrumental variable, we follow Fernandes, Lynch, and Netemeyer (2014) and Murendo and Mutsonziwa (2017) in using the mean financial literacy score at the district level. One may argue that districts with higher levels of economic development may also

⁵ The score for savings behavior is based on whether the respondent holds any type of savings account or participates in savings clubs (i.e., formal savings). Savings, however, could take other forms, such as holding cash in hand, building a balance in a current account, giving money to a family member to save, buying gold, property or livestock, etc.

⁶ One may argue that if other household members experienced a negative financial shock, they may ask the respondent to save more to offset this, which would violate the exogeneity condition on the instrumental variable. To test for correlation between family financial shocks and savings, we re-estimated Equation 1 controlling for our three instrumental variables. We find that, as long as the financial literacy score is controlled for, these three instrumental variables do not have any statistically significant association with savings.

have better financial development and thus average financial literacy will tend to be higher in these districts. To address this issue, we control for the level of development of the district by using the share of people who have an income higher than the median income for the country.

We expect that these instrumental variables do not directly affect the respondents' savings behavior but affect it only indirectly through their financial literacy. Our first stage equations take the form:

$$FL_i = \alpha_0 + Z_i\alpha_2 + X_i\alpha_3 + \epsilon_i \quad (3)$$

where Z_i is a vector of the given instrumental variables; X_i is a vector of control variables; and ϵ_i is the error term. We include all control variables used in equations (1) and (2).

4. Financial Inclusion and Financial Literacy in Laos: Stylized Facts

Table 1 presents average values of the scores of financial literacy and financial inclusion in the sample with breakdowns by respondent characteristic. The average financial inclusion score is 2.59. This is rather low compared with countries in the G20 group (5.73) but it is expected given the level of Lao GDP per capita. Figure 1 shows there is a high correlation between the average financial inclusion score and per capita GDP (0.75). The scores of Laos, together with some developing Asian economies such as Viet Nam, Cambodia, Malaysia, and Thailand, lie along the trend line while that of Indonesia lies slightly below the trend line. The scores of India, the PRC and the Republic of Korea lie well above the trendline. Scores of a number of the advanced economies lie below the trend line. This is partly attributed to the fact that in these economies, the second components of financial inclusion (i.e. active consumption components) is rather low and comparable to that of developing countries.

[Figure 1]

Figure 2 shows that the shares of people holding different financial products in Laos are much smaller than for their counterparts in the G20 group. For example, only 12% of Lao people hold at least one payment product while the figure for people in the G20 countries is 66%. However, in terms of other indicators such as active product choice or alternatives to formal finance, Lao people seem to do better than people in the G20 countries.

[Figure 2]

With regards to savings behavior, while the proportion of respondents who have formal savings products is rather low (24%), the percentage of respondents who save in some form is much higher. About 65% of respondents reported that they have savings in some form, ranging from the informal varieties of keeping money at home or asking friends, relatives or other

family members to hold money for them to the formal types of maintaining current accounts in banks or buying savings products, as well as holding formal bank savings accounts. Some respondents (about 24.4%) save in both formal and informal ways. Only 7.9% of respondents do not save in any form.

The average financial literacy score of respondents in our sample is 12.5 on a scale of 21 points. With respect to the three components, the financial knowledge average is 3.68 (out of 7); the financial behavior average is 5.55 (out of 9), and financial attitude average is 3.26 (out of 5). As shown in Figure 3, the Lao financial literacy score is lower than those of many developing Asian economies, including China (14.1), Indonesia (13.4), Thailand (12.8), and Viet Nam (12.7). On the other hand, the Lao score is slightly higher than those of Malaysia (12.3), India (11.9), and Cambodia (11.8). These results may be taken as neutral to positive, given that the level of per capita income in Laos is considerably lower than in the other 30 countries in the OECD/INFE sample (2016).

[Figure 3]

[Table 1]

[Figure 4]

Figure 3 presents the percentage of correct responses to the 21 financial literacy questions in comparison with results for the G20. Generally, the share of Laotians giving correct answers to financial knowledge questions is lower than for their G20 counterparts, especially for more difficult questions (e.g., relating to compound interest). Nevertheless, Laotians do seem to be “savvier” than G20 residents in their financial behavior. For six of the nine behavior indicators, the proportion of Laotians with desired responses is higher than that of G20 residents. Laotians also have better long-term financial planning behavior than individuals in the G20 countries. Figure 4 shows there is a fairly high correlation between the average financial literacy score and per capita GDP (0.63), although there is still wide variation relative to the trend line. The scores of the Lao PDR and Viet Nam lie above the trend line while that of Cambodia lies slightly below the trend line. Except for Malaysia, the scores of all other Asian economies (including the PRC; Hong Kong, China; India; Indonesia; Republic of Korea, and Thailand) lie either above or close to the trend line.

[Figure 5]

Differences emerge among socio-demographic groups within Laos. Urban residents have higher financial literacy scores than their rural counterparts by 0.46 points on a 21 point scale, and the gap carries over to all three sub-indices. The financial literacy scores of men are slightly

higher than those of women. The differences are not large, and in most cases the regression results do not show significant differences by gender when other factors are controlled for. Our data also indicate that younger, better educated and higher income individuals have higher financial literacy and financial knowledge scores. However, financial behavior and financial attitude scores do not show a consistent pattern across different groups of respondents.

4.2. Descriptive Statistics

Table 2 presents the descriptive statistics of explanatory variables included in the econometric models for the Laos. Income per month is less than 2 million kip for 56.5% of respondents, between 2 million and 3.5 million kip for 29.5%, and more than 3 million kip for 14%. Just over half (56%) of respondents have attended only primary school, 32.9% have attended secondary school, and 11.1% have received tertiary education. Most of the respondents (60%) are 30–60 years old. The respondents younger than age 30 account for 27.1% and those over age 60 for 12.8%. With regards to work, most are self-employed (67.6%) while paid employees make up just 15.3%. About 74% of respondents live in rural areas, and only 45.2% respondents are male.

[Table 2]

5. Effects of Financial Literacy on Financial Inclusion and Savings Behavior

5.1 Effect of Financial Literacy on Financial Inclusion

Table 3 reports estimation results on the effect of financial literacy on financial inclusion. Columns (1)-(3) report OLS results with the dependent variables being the financial inclusion score and its two subscores (holding products and active consumption), respectively. Results in column (1) show that financial literacy is positively associated with financial inclusion, and this relationship is statistically significant at the 1% level. A one standard deviation increase in the financial literacy score is associated with an increase of 0.24 standard deviations in the financial inclusion score. This result is consistent with the results of Morgan and Trinh (2019a) for Cambodia and Viet Nam, although the magnitude of the association is somewhat larger in these countries (0.34 and 0.42 standard deviations, respectively). Our empirical results further show that financial literacy is positively associated with both components of financial inclusion. A one standard deviation increase in the financial literacy score raises the holding products score by 0.14 standard deviations and the active consumption score by 0.24 standard deviations, respectively.

Higher income is also positively associated with financial inclusion, and this relationship is statistically significant at the 1% level. Even when financial literacy and income are controlled

for, higher education levels are significantly associated with higher financial inclusion. These results are consistent with previous literature (Morgan and Trinh 2019a; Adetunji and David-West 2019, Allen et al. 2016). Age is also correlated with financial inclusion. Older people tend to have higher financial inclusion scores than do younger ones. Specifically, relative to those under age 30, those aged 30-60 have a financial inclusion z-score that is higher by 0.19 standard deviations and those aged 60 or over by 0.25 standard deviations. However, we did not find a correlation between the employment status of respondents and financial inclusion. This result is in line with Morgan and Trinh (2019a). Interestingly, when other individual characteristics are controlled for, there is no difference in financial inclusion between men and women. The results also indicate that people living in rural areas have lower financial inclusion scores and those who live closer to commercial banks have higher financial inclusion scores. This latter result highlights the importance of supply-side access for financial inclusion.

The results further show that individual characteristics are related to the two components of financial inclusion in different ways. Specifically, while income is positively associated with holding financial products, it is not significantly associated with active consumption. Similarly, age is positively associated with holding financial products but not significantly associated with active consumption.

[Table 3]

Columns (4)-(6) of Table 3 present estimation results using instrumental variables. The first-stage estimation results are reported in Appendix Table A6. The first-stage results show that all of our instrumental variables (i.e., mathematical ability, financial shocks experienced by family members, and the average financial literacy score at the district level) are related to financial literacy with statistical significance at the 1% or 5% levels. The Anderson Wald test and Cragg-Donald Wald test statistics indicate that our set of instrumental variables does not suffer from under-identification or weak instrument problems, respectively. The Sargan test also indicates that our instrumental variables satisfy the exclusion condition, except for the active consumption subscore.

The estimation results confirm positive and significant effects of financial literacy on the financial inclusion score and its two sub-components, implying that an increase in financial literacy helps to improve not only financial inclusion in general but both holding financial products and active consumption. Specifically, a one standard deviation increase in the financial literacy score is associated with an increase of 0.39 standard deviations in the financial inclusion score; 0.22 standard deviations in the holding products subscore; and 0.41 standard deviations in the active consumption subscore. We also find that IV coefficient estimates are

larger than the OLS estimates. This result is consistent with most other studies that use IV's for financial literacy, such as Bucher-Koenen and Lusardi (2011), Agnew et al. (2013), and Morgan and Trinh (2019a). According to Lusardi and Mitchell (2014), the true effect of financial literacy seems to be biased downward in OLS estimation. This downward bias may be explained by the measurement errors in calculating financial literacy. As van Rooij et al. (2011) argued, responses to financial knowledge questions may involve guessing or from their willingness to reveal their true intention (for financial behavior and financial attitude questions).⁷ The OLS upward bias also results from the case that those who are affected by the instruments may give better response.⁸

Table 4 presents estimation results for the effects of financial literacy on the four individual indicators of the holding products component.⁹ The Anderson Wald test and Cragg-Donald Wald test statistics indicate that our set of instrumental variables does not suffer from under-identification or weak instrument problems, respectively. The Sargan test suggests that our instrumental variables satisfy the exclusion condition. The estimation results show that financial literacy has statistically significant effects only on holding of savings products and credit products, although the significance level for the former is only at the 10% level. A one standard deviation increase in the financial literacy score increases the likelihood of holding savings products by 6.7 percentage points and of holding credit products by 10.1 percentage points. Financial literacy does not have statistically significant impacts on holding payment or insurance products. However, this result should be interpreted in the context of Laos where payment products and insurance products are still quite underdeveloped (Morgan and Trinh 2019b).

[Table 4]

We further examine the effect of each component of financial literacy (financial knowledge, financial behavior, and financial attitude) on financial inclusion and its components. The estimation results are presented in Table 5. We use the OLS estimator due to difficulties in finding instrumental variables for all three variables. The empirical results suggest that while

⁷ Van Rooij et al. (2011) argued that if respondents are familiar with the questions, the measurement errors in financial literacy may cause the OLS estimates be upward biased. However, this is not the case in our study.

⁸ For example, those who were good at mathematics in school may more correctly answer the financial knowledge questions or those whose family members experienced financial shocks may better answer financial attitude or financial behavior questions.

⁹ As presented in Figure 1, the proportion of Laotians who hold financial products is much lower than that of individuals in G20 countries while the proportion that give desired responses to questions in the active consumption component is more comparable. Therefore, we focus more on examining the role of financial literacy on each of the four indicators of the holding financial products, since there may be more room for policy to have an effect in catching up.

financial knowledge and financial behavior are significantly associated with financial inclusion, financial attitude is not. Also, the relationship between financial behavior and financial inclusion seems to be stronger than that between financial attitude and financial inclusion. However, this result should be interpreted cautiously. There may be some multicollinearity among three components of financial literacy.

[Table 5]

Looking at the two components of financial inclusion (columns (2) and (7)) and the four indicators in holding products (columns (3)-(6)), we also find differences in the relationship between the various components of financial literacy and the different financial inclusion indicators. Financial behavior has a positive association with both components of financial inclusion as well as all indicators of holding financial products, except for insurance products. Financial knowledge is positively related with active consumption but not with holding financial products or any of the four indicators of this component. Financial attitude is correlated with two indicators of holding financial products (payment products and credit products) but is not correlated with the active consumption component.

5.2 Effects of Financial Literacy on Savings Behavior

Table 6 presents the regression results for the relation between financial literacy and savings behavior.¹⁰ All three dependent variables are binary indicating the presence of different types of savings: (i) savings in either formal or informal modes in the previous year (column (1)); (ii) savings in formal modes in the previous year (column (2)); and (iii) savings in formal modes in the previous two years, regardless of whether the savings were still held (column (3)). We use the instrumental variables approach with linear probability regressions for our three indicators of savings. First-stage regression results remain as in Appendix Table A6. The Anderson Wald test and Cragg-Donald Wald test statistics indicate that our set of instrumental variables does not suffer from under-identification or weak instrument problems, respectively. The Sargan test further suggests that our instrumental variables satisfy the exclusion condition, except in the case of the financial inclusion subscore relating to active consumption.

[Table 6]

The results show a positive and significant impact of financial literacy on all three indicators of savings behavior at significance levels of 5% or 10%. When we control for endogeneity of financial literacy, the coefficient estimates of financial literacy are slightly higher. Specifically, as reported in column (2), a one standard deviation increase in the financial literacy

¹⁰ In Appendix Table A7, we examine the role of each component of financial literacy (financial knowledge, financial behavior, and financial attitude) on savings behavior.

score (2.56 points) raises the likelihood of having a formal savings product by 9.3 percentage points (versus an increase of 7.5 percentage points if endogeneity is not controlled for). And as reported in column (3), the increase in financial literacy raises formal savings in the last two years by 7.2 percentage points (versus 5.1 percentage points if endogeneity is not controlled for). However, as shown in column (1), when controlling for endogeneity the likelihood of having any type of savings is reduced to 4.2 from 6.8 percentage points.

The probability of having formal savings in the previous year among those with an income of 2 million kip to 3.5 million kip (more than 3.5 million kip) is 10.2 (16.3) percentage points higher than for those who have an income less than 2 million kip. The same pattern holds for the case of having formal savings in the previous two years (column (3)). Employment status also has a significant impact on having savings. While those who are disabled, students, or retired are less likely to have savings than those who do not want to work (the reference group), self-employed and paid employees are more likely to have formal savings.

For education, relative to the reference group of tertiary level, those with only primary education have a lower probability of having savings by any of the measures while the difference for those with secondary education is not significant. The correlation between education level and savings is also observed in Cambodia and, to some extent, Viet Nam (Morgan and Trinh 2019a).

People over age 60 are more likely to have savings than those under age 30 by about 13 to 15 percentage points. This result is consistent with several previous studies (Morgan and Trinh 2019a, Baidoo et al. 2018). Also, there is no difference in savings probability between men and women. And rural residents show a higher probability of having savings in either formal or informal forms, but not in formal forms narrowly. We did not find any relationship between the distance from a bank branch and savings, even formal savings.

Finally, we estimate how financial literacy affects the choice of savings types. The dependent variables include three mutually exclusive groups of individuals: those with no savings; those with only informal savings; and those with both informal and formal savings.¹¹ Estimation is by multinomial probit regression with results, expressed as marginal effects, reported in Table 7. Results in column (1) show a negative relationship between the financial literacy score and the probability of not having savings. A one standard deviation increase in the financial literacy score reduces the likelihood of not having savings by 5.8 percentage points. Results in column (2) indicate that a higher financial literacy score is negatively associated with the probability of having only informal savings. However, as expected, the negative effect of the

¹¹ We exclude individuals who hold only formal savings because there are only 24 people in this group.

financial literacy score on having only informal savings is lower than that on having no savings. And in column (3), the results show the financial literacy score has a strong positive effect on having both formal and informal savings. If the financial literacy score increases by one standard deviation, the likelihood of having savings in both formal and informal forms increases by 8.4 percentage points.¹²

[Table 7]

6. CONCLUSIONS

Using a dataset recently collected for Laos, this study examines the effects of financial literacy on financial inclusion and savings behavior. To begin, we construct comprehensive financial literacy and financial inclusion scores. The former consists of three components: financial knowledge, financial behavior and financial attitude. The latter consists of two components: holding of financial products and active financial consumption. We then examine how each financial literacy and each of its components affects financial inclusion and its components. We use an instrumental variables approach to reduce concerns about endogeneity.

Our analysis yields several important findings. First, financial literacy has broadly statistically significant effects on financial inclusion and savings. Specifically, a one standard deviation increase in the financial literacy score increases the financial inclusion score by 0.39 standard deviations and the likelihood savings by 4.2-9.3 percentage points, depending on the type of savings. These results corroborate with results from previous studies such as Morgan and Trinh (2019a), Adetunji and David-West (2019), and Allen et al. (2016).

Second, while overall financial literacy is positively associated with financial inclusion and its two components, not all three components of financial literacy are positively associated with financial inclusion. Specifically, a higher financial behavior score is associated with a higher overall financial inclusion score and more specifically with higher holding of financial products and higher active consumption. However, the financial knowledge score is only associated with the overall financial inclusion score and the active consumption component. The financial attitude score is not associated with the overall financial inclusion score or the active consumption component, but is associated with holding financial products and more specifically payment products and credit products).

Third, the effects of financial literacy on different components and on different indicators of financial inclusion vary. A one standard deviation increase in the financial literacy

¹² Appendix Table A8 presents results that distinguish the effects of components of financial literacy on the form of savings. We find that different components of financial literacy have different relations with savings.

score is associated with an increase of 0.22 standard deviations in the subscore for holding financial products while the increase for the active consumption subscore is 0.41 standard deviations. Higher financial literacy is also associated with a higher likelihood of holding savings and credit products but is not associated with holding payment and insurance products.

Fourth, individuals with higher financial literacy scores tend to save more in both formal and informal ways than those who have lower financial literacy scores, even when we control for income and education. The results suggest that richer and more educated people tend to hold both formal and informal savings while people with some primary education are more likely to hold only informal savings. Furthermore, younger people (aged 18-30) are less likely to hold formal savings but no less likely to hold informal savings. People in rural areas are more likely to holding savings informally than people in urban areas. This may be because of a lower level of financial development and less ready access to financial services.

Some policy implications may be derived from the results of this study. First, our findings suggest not only that financial literacy is important for improving financial inclusion, but that particular components of financial literacy are more important achieving particular financial inclusion goals. This understanding is important for designing a financial education program. Second, our findings suggest that certain demographic groups be targeted for the interventions. In particular, policies to encourage savings could achieve their greatest potential gains if targeted at younger and less educated people.

Our study suffers some limitations. First, due to data limitations, we cannot examine how financial literacy affects magnitudes of savings. Using dummy variables to capture savings behavior misses the nuances of the relationship, for example, with regard to differences in the response to financial literacy between those who save a large share of their incomes and those who save a small share. Second, while we are confident of our instrumental variables for overall financial literacy, finding instrumental variables for each of three components of financial literacy is more elusive. Thus, we cannot claim to credibly identify a causal relationship between each component of financial literacy and overall financial inclusion, or its components and indicators. Third, this study did not examine the heterogeneous effects of financial literacy on financial inclusion and savings decisions by characteristics of respondents that might be of interest. In particular, several studies have shown that the effects of financial literacy may be different for those who are risk averse or those with herd behavior. These limitations point the way to further studies in this area.

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Table 1. Financial Literacy and Financial Inclusion Scores by Respondent Characteristic

	All	Urban	Rural	Women	Men	Age 18-30	Age 30-60	Age over 60	Tertiary education	Secondary education	Primary education	Income <median	Income >median
Financial knowledge	3.68	3.82	3.63	3.58	3.79	3.67	3.70	3.58	4.20	3.90	3.45	3.46	3.96
Knowledgeable share (%)	30	34	28	28	32	29	30	29	44	34	25	25	36
Financial behavior	5.55	5.67	5.51	5.58	5.50	5.33	5.75	5.07	5.94	5.69	5.41	5.32	5.84
Financial attitude	3.26	3.34	3.24	3.25	3.28	3.38	3.26	3.04	3.53	3.31	3.18	3.17	3.39
Financial literacy	12.49	12.83	12.37	12.42	12.57	12.38	12.71	11.69	13.67	12.90	12.04	11.94	13.19
Financial inclusion	2.59	2.97	2.46	2.56	2.63	2.48	2.66	2.52	3.35	2.89	2.28	2.25	3.04
Formal savings (%)	24.0	33.1	20.8	24.1	23.9	24.7	22.0	32.0	41.8	31.5	16.2	15.5	35.0

Note: Knowledgeable share refers to the proportion answering correctly at least 5 of 7 questions on financial knowledge.

Source: Authors' calculation.

Table 2: Descriptive Statistics

	Mean	
	%	St.Dev
Income < 1mil kip	56.5	0.496
Income 2-3.5mil kip	29.5	0.456
Income >3.5mil kip	14.0	0.347
Tertiary education	11.1	0.314
Secondary education	32.9	0.470
Primary education	56.0	0.497
Age 18-30	27.1	0.445
Age 30-60	60.1	0.490
Over >60	12.8	0.334
Male	45.2	0.498
Self-employed	67.6	0.468
Paid employee	15.3	0.360
Disabled/student/retired	5.9	0.236
Other	11.2	0.316
Rural	74.0	0.439
Better math	65.5	0.476
Family shocks	44.9	0.498

Note: Sample size is 989.

Source: Authors' calculation.

Table 3. Financial Literacy Effect on Financial Inclusion

	OLS			IV (2nd stage)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Financial inclusion score	Holding products subscore	Active consumption subscore	Financial inclusion score	Holding products subscore	Active consumption subscore
Financial literacy score	0.236*** [0.028]	0.142*** [0.030]	0.238*** [0.031]	0.392*** [0.084]	0.222** [0.087]	0.408*** [0.088]
Income 2-3.5mil kip	0.185** [0.075]	0.188** [0.077]	0.116 [0.076]	0.135* [0.077]	0.163** [0.079]	0.062 [0.080]
Income >3.5mil kip	0.407*** [0.101]	0.568*** [0.111]	0.114 [0.102]	0.360*** [0.100]	0.543*** [0.103]	0.062 [0.104]
Secondary education	-0.191* [0.102]	-0.206 [0.127]	-0.108 [0.095]	-0.154 [0.106]	-0.187* [0.109]	-0.068 [0.111]
Primary education	-0.529*** [0.112]	-0.486*** [0.134]	-0.380*** [0.110]	-0.448*** [0.118]	-0.444*** [0.121]	-0.291** [0.123]
Age 30-60	0.189*** [0.071]	0.217*** [0.071]	0.095 [0.076]	0.153** [0.073]	0.199*** [0.075]	0.056 [0.076]
Age >60	0.254** [0.106]	0.341*** [0.110]	0.083 [0.110]	0.265** [0.104]	0.347*** [0.107]	0.094 [0.109]
Male	-0.037 [0.059]	-0.097 [0.060]	0.032 [0.062]	-0.034 [0.059]	-0.096 [0.061]	0.035 [0.062]
Self-employed	0.114 [0.094]	0.067 [0.091]	0.116 [0.100]	0.078 [0.099]	0.049 [0.102]	0.077 [0.103]
Paid employee	0.023 [0.115]	0.057 [0.123]	-0.017 [0.121]	0.001 [0.123]	0.046 [0.127]	-0.041 [0.128]
Disabled/student/retired	0.074 [0.147]	0.014 [0.152]	0.102 [0.151]	0.033 [0.154]	-0.007 [0.158]	0.058 [0.160]
Rural area	-0.032 [0.083]	-0.037 [0.089]	-0.015 [0.085]	-0.033 [0.085]	-0.037 [0.087]	-0.017 [0.088]
Distance to bank (mins)	-0.002** [0.001]	-0.001 [0.001]	-0.003** [0.001]	-0.002* [0.001]	-0.001 [0.001]	-0.002** [0.001]
% of district with income >2mil kip	0.565*** [0.155]	0.393** [0.163]	0.520*** [0.160]	0.540*** [0.160]	0.381** [0.165]	0.493*** [0.167]
Intercept	-0.040 [0.174]	-0.242 [0.185]	0.162 [0.178]	0.187 [0.172]	-0.225 [0.181]	0.199 [0.183]
Anderson canon. corr. LM statistic				137.749	137.749	137.749
Cragg-Donald Wald F statistic				52.430	52.430	52.430
Sargan statistics (p-value)				0.105	0.183	0.064
R-squared	0.253	0.2028	0.1972	0.2422	0.194	0.146
N	989	989	989	989	989	989

Note: Figures in bracket are standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The dependent variables are z-scores. Province dummies are included in all specifications.

Source: Authors' estimation.

Table 4. Financial Literacy Effect on Product Holdings by Type (IV estimation)

	(1)	(2)	(3)	(4)
	Payment products	Savings products	Insurance products	Credit products
Financial literacy score	0.012 [0.029]	0.067* [0.038]	-0.003 [0.032]	0.101*** [0.039]
Income 2-3.5mil kip	0.024 [0.027]	0.082** [0.035]	-0.012 [0.029]	0.036 [0.036]
Income >3.5mil kip	0.062* [0.035]	0.168*** [0.045]	0.099*** [0.038]	0.107** [0.046]
Secondary education	-0.109*** [0.037]	-0.031 [0.048]	-0.007 [0.040]	-0.003 [0.049]
Primary education	-0.195*** [0.041]	-0.136** [0.054]	-0.045 [0.044]	0.020 [0.055]
Age 30-60	0.053** [0.026]	-0.020 [0.033]	0.077*** [0.028]	0.049 [0.034]
Age >60	0.021 [0.036]	0.156*** [0.047]	0.049 [0.039]	0.052 [0.048]
Male	0.012 [0.021]	-0.022 [0.027]	-0.036 [0.022]	-0.031 [0.027]
Self-employed	0.012 [0.034]	0.012 [0.045]	0.029 [0.037]	-0.014 [0.046]
Paid employee	-0.002 [0.043]	0.056 [0.056]	0.071 [0.046]	-0.089 [0.057]
Disabled/student/retired	0.037 [0.054]	-0.015 [0.070]	0.015 [0.058]	-0.042 [0.071]
Rural area	-0.069** [0.030]	0.014 [0.038]	0.048 [0.032]	-0.023 [0.039]
Distance from bank (mins)	-0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
% of district with income >2mil kip	0.071 [0.056]	0.198*** [0.073]	0.030 [0.060]	0.007 [0.074]
Anderson canon. corr. LM statistic	137.749	137.749	137.749	137.749
Cragg-Donald Wald F statistic	52.430	52.430	52.430	52.430
Sargan statistics (p-value)	0.033	0.314	0.413	0.559
R-squared	0.199	0.323	0.170	0.218
N	989	989	989	989

Note: Figures in bracket are standard errors. ***, **, and * denote statistically significant at the 1%, 5%, and 10% levels, respectively. The dependent variables are dummies with models estimated by linear probability regression. Province dummies are included in all specifications.

Source: Author's estimation

Table 5. Financial Literacy Components Effect on Financial Inclusion by Component

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Financial inclusion score	Holding products sub-score	Holding payment product	Holding savings product	Holding insurance product	Holding credit product	Active consumption sub-score
Financial knowledge score	0.051* [0.029]	0.016 [0.031]	0.004 [0.010]	0.007 [0.014]	-0.013 [0.011]	0.014 [0.014]	0.065** [0.030]
Financial behavior score	0.269*** [0.028]	0.148*** [0.028]	0.031*** [0.010]	0.054*** [0.013]	0.008 [0.010]	0.027** [0.013]	0.283*** [0.031]
Financial attitude score	0.010 [0.028]	0.065** [0.029]	0.021** [0.009]	0.017 [0.013]	-0.015 [0.010]	0.029** [0.012]	-0.044 [0.029]
Income 2-3.5mil kip	0.276*** [0.070]	0.250*** [0.074]	0.028 [0.025]	0.119*** [0.034]	-0.004 [0.025]	0.058* [0.033]	0.201*** [0.070]
Income >3.5mil kip	0.497*** [0.096]	0.631*** [0.109]	0.067* [0.040]	0.209*** [0.046]	0.105** [0.042]	0.127*** [0.044]	0.195** [0.095]
Secondary education	-0.223** [0.102]	-0.218* [0.128]	-0.105** [0.051]	-0.042 [0.057]	-0.012 [0.043]	-0.016 [0.048]	-0.148 [0.092]
Primary education	-0.576*** [0.111]	-0.511*** [0.134]	-0.188*** [0.051]	-0.158*** [0.058]	-0.052 [0.045]	-0.012 [0.051]	-0.431*** [0.107]
Age 30-60	0.173** [0.070]	0.219*** [0.070]	0.050** [0.024]	-0.014 [0.031]	0.075*** [0.024]	0.065** [0.031]	0.068 [0.074]
Age >60	0.274*** [0.104]	0.378*** [0.110]	0.031 [0.033]	0.169*** [0.051]	0.048 [0.038]	0.055 [0.048]	0.080 [0.108]
Male	-0.037 [0.058]	-0.101* [0.060]	0.012 [0.020]	-0.025 [0.027]	-0.035 [0.022]	-0.033 [0.027]	0.035 [0.061]
Self-employed	0.126 [0.092]	0.088 [0.090]	0.013 [0.027]	0.025 [0.044]	0.029 [0.029]	0.004 [0.047]	0.115 [0.098]
Paid employee	0.020 [0.114]	0.080 [0.122]	0.003 [0.043]	0.066 [0.058]	0.069 [0.042]	-0.073 [0.054]	-0.043 [0.121]
Disabled/student/retired	0.110 [0.144]	0.054 [0.151]	0.041 [0.058]	0.005 [0.072]	0.017 [0.047]	-0.020 [0.065]	0.122 [0.151]
Rural area	-0.100 [0.081]	-0.077 [0.087]	-0.075** [0.033]	-0.007 [0.040]	0.043 [0.035]	-0.023 [0.039]	-0.087 [0.083]
Distance from bank (mins)	-0.003*** [0.001]	-0.001 [0.001]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.004*** [0.001]
Intercept	0.197 [0.159]	-0.106 [0.175]	0.234*** [0.065]	0.224*** [0.078]	-0.029 [0.056]	0.210*** [0.076]	0.406** [0.162]
R squared	0.275	0.205	0.118	0.143	0.140	0.08	0.222
Number of observations	989	989	989	989	989	989	989

Note: Figures in bracket are standard errors. ***, **, and * denote statistically significant at the 1%, 5%, and 10% levels, respectively. Dependent variables are z-scores for columns (1), (2), and (7) and dummy variables for columns (3)-(6). The Province dummies are included in all specifications.

Source: Author's estimation

Table 6. Financial Literacy Effect on Savings (IV approach)

	(1)	(2)	(3)
	Savings (formal and informal)	Formal savings previous year	Formal savings previous 2 years
Financial literacy score	0.042* [0.022]	0.093** [0.041]	0.072* [0.039]
Income 2-3.5mil kip	0.036* [0.020]	0.071* [0.039]	0.080** [0.038]
Income >3.5mil kip	0.023 [0.026]	0.128** [0.050]	0.166*** [0.050]
Secondary education	-0.027 [0.025]	-0.053 [0.057]	-0.026 [0.056]
Primary education	-0.052* [0.027]	-0.154** [0.062]	-0.132** [0.061]
Age 30-60	0.017 [0.020]	0.071** [0.033]	-0.021 [0.032]
Age >60	0.018 [0.029]	0.132*** [0.050]	0.154*** [0.049]
Male	-0.022 [0.017]	-0.027 [0.027]	-0.019 [0.026]
Self-employed	0.011 [0.029]	0.093** [0.041]	0.014 [0.045]
Paid employee	0.020 [0.031]	0.099* [0.055]	0.059 [0.058]
Disabled/student/retired	-0.153*** [0.058]	0.008 [0.067]	-0.017 [0.071]
Rural area	0.051** [0.026]	-0.011 [0.041]	0.014 [0.040]
% of district with income > 2mil kip	-0.040 [0.043]	0.196*** [0.072]	0.193*** [0.072]
Distance from bank (mins)	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Intercept	0.866*** [0.051]	0.153* [0.081]	0.069 [0.079]
Anderson canon. corr. LM statistic	99.532	99.532	99.532
Cragg-Donald Wald F statistic	46.349	46.349	46.349
Sargan statistics (p-value)	0.542	0.624	0.358
R-squared	0.140	0.143	0.169
Number of observations	989	989	989

Note: Figures in brackets are standard errors. ***, **, and * denote significant at the 1%, 5%, and 10% statistical levels, respectively. The dependent variables are dummies with models estimated by linear probability regression. Province dummies are included in all specifications.

Source: Authors' estimation.

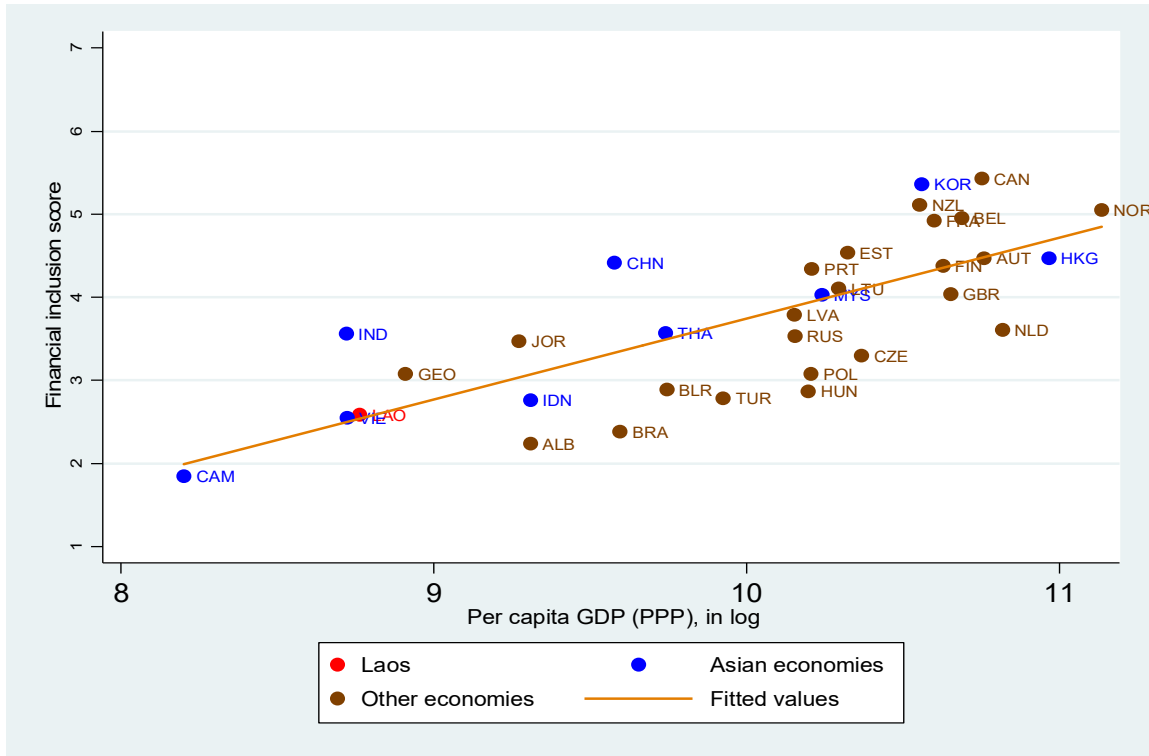
Table 7. Financial Literacy Effect on Savings by Type (Marginal effects)

	(1)	(2)	(3)
	No savings	Informal savings	Formal & informal savings
Financial literacy score	-0.059*** [0.008]	-0.026 [0.016]	0.084*** [0.014]
Income 2-3.5mil kip	-0.027 [0.019]	-0.074** [0.036]	0.101*** [0.032]
Income > 3.5mil kip	-0.03 [0.022]	-0.136*** [0.048]	0.166*** [0.044]
Secondary education	-0.003 [0.028]	0.037 [0.058]	-0.035 [0.053]
Primary education	0.017 [0.031]	0.122** [0.060]	-0.139** [0.055]
Age 30–60	-0.011 [0.019]	-0.087** [0.034]	0.098*** [0.030]
Age > 60	-0.017 [0.025]	-0.127** [0.055]	0.143*** [0.050]
Male	0.021 [0.016]	0.024 [0.030]	-0.045* [0.027]
Self-employed	-0.017 [0.024]	-0.093** [0.045]	0.110*** [0.039]
Paid employee	-0.03 [0.029]	-0.062 [0.058]	0.092* [0.052]
Disabled/student/retired	0.163*** [0.059]	-0.211*** [0.079]	0.048 [0.061]
Rural area	-0.066*** [0.024]	0.096** [0.041]	-0.03 [0.036]
Number of observations	966		

Note: Figures in brackets are standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The multinomial probit estimator is used. The three groups are: (i) no savings; (ii) informal savings only; and (iii) both formal and informal savings. We do not use the group of only formal savings because it has only 24 observations (versus 19 covariates in our model). Province dummies are included in all specifications.

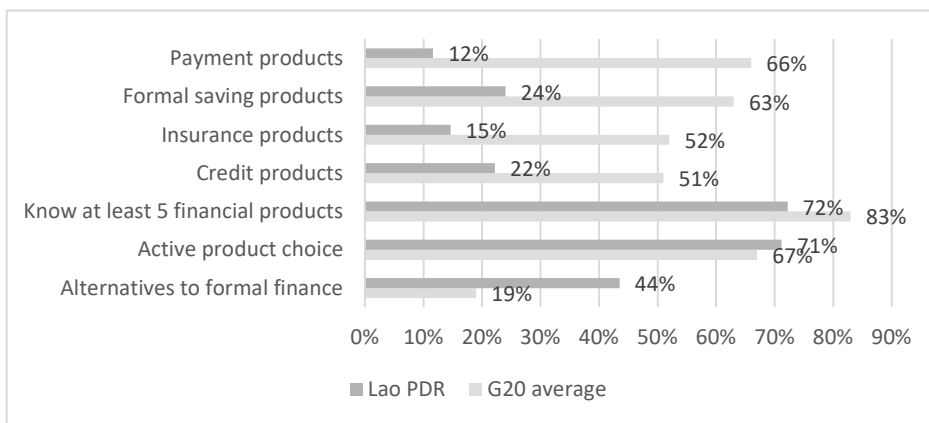
Source: Authors' estimation.

Figure 1. Financial inclusion score vs. GDP per capita



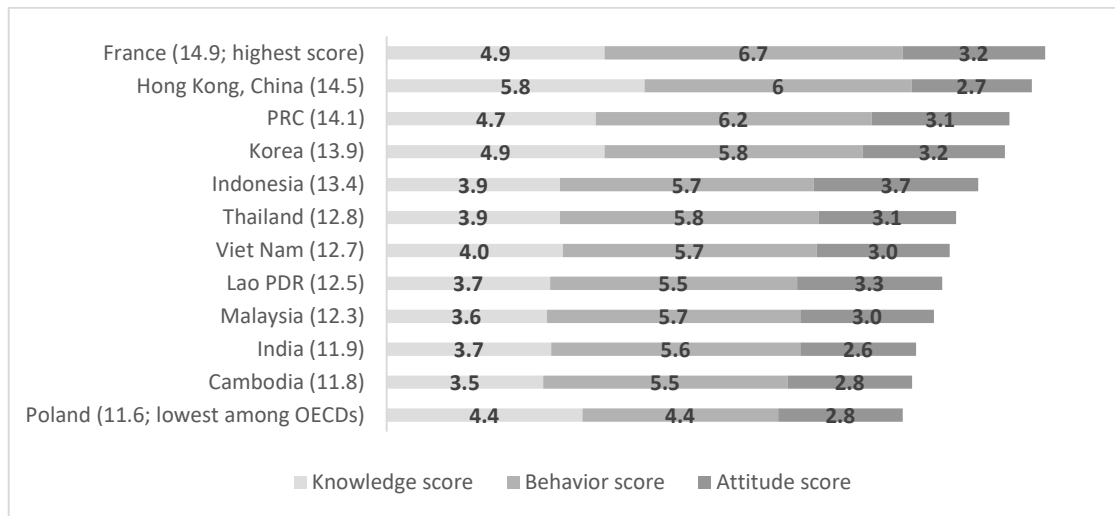
Source: OECD/INFE (2017), Morgan and Trinh (2019), World Bank World Development Indicator database (<http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>), authors' calculation.

Figure 2: Financial Inclusion Indicators, Laos vs. G20



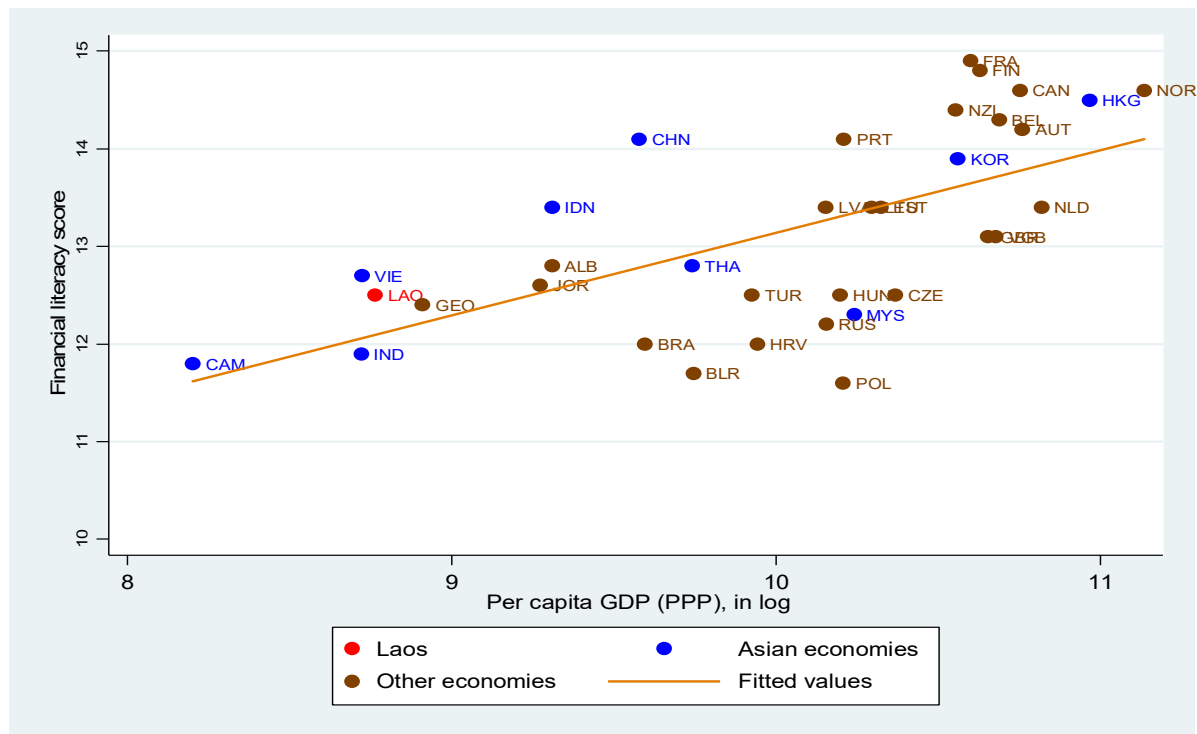
Source: OECD (2016), and authors' compilation from survey data.

Figure 3. Financial Literacy Scores in Selected Countries



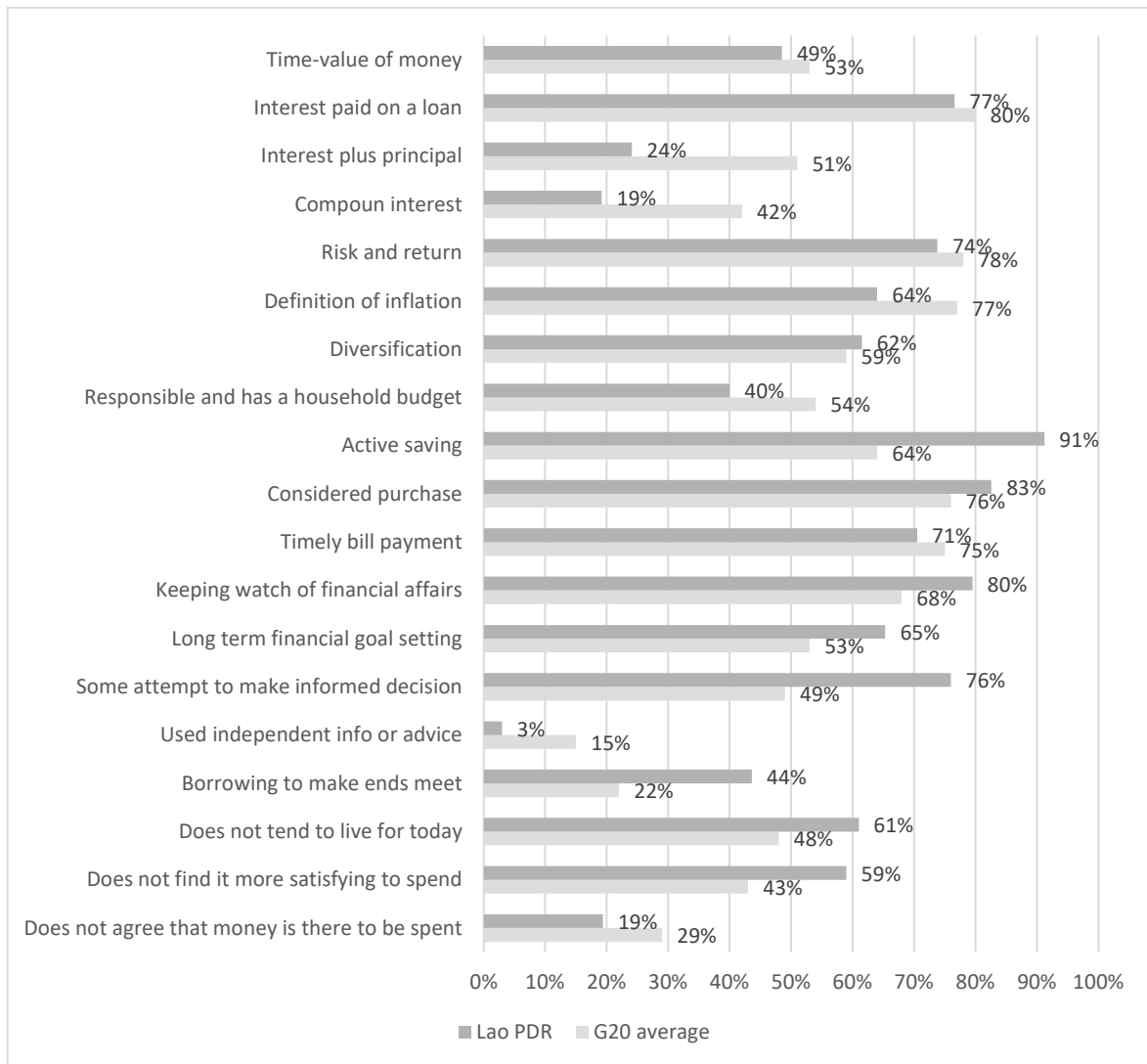
* Note: Highest and lowest scores within the sample of 30 OECD/INFE countries (2016).
Source: OECD (2016), and authors' compilation from survey data.

Figure 4: Financial literacy score vs. GDP per capita



Source: OECD/INFE (2017), Morgan and Trinh (2019), World Bank World Development Indicator database (<http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>), authors' calculation.

Figure 5. Share of Correct Responses, Laos vs. G20



Source: OECD/INFE (2017), and authors' calculations.

Appendix

Table A1: Sample Distribution Statistics

Province	Population	Sample number	% male	% female	% age 18-30	% age 30-60	% over age 60
Vientiane Capital	55,018	60	31.7	68.3	25.0	70.0	5.0
Oudomxay	146,250	180	50.0	50.0	29.4	56.7	13.9
Laungpabang	220,665	120	40.8	59.2	39.2	52.5	8.3
Bolikhamxai	154,770	110	49.1	50.9	19.1	69.1	11.8
Khammuan	219,264	130	33.1	66.9	29.2	55.4	15.4
Savanaket	566,675	200	50.5	49.5	24.0	56.5	19.5
Sekong	45,095	60	40.0	60.0	36.7	61.7	1.7
Champasak	384,295	140	45.7	54.3	19.3	68.6	12.1
Total	2,287,194	1,000	44.4	55.6	27.1	60.1	12.8

Source: Authors' calculation

Table A2: Computation of Financial Inclusion Score

Indicator	Question #	Discussion	Valuation
Holds payment product	Qprod1_b	Products may include prepaid cards and current/checking accounts.	Equals 1 if product is held; 0 otherwise
Holds saving or retirement product	Qprod1_b	Products may include pensions, investment accounts, savings accounts, or savings clubs.	Equals 1 if product is held; 0 otherwise
Holds insurance	Qprod1_b	Products may include car or travel insurance.	Equals 1 if product is held; 0 otherwise
Holds credit product	Qprod1_b	Products may include mortgages, credit cards, and microloans.	Equals 1 if product is held; 0 otherwise
Aware of at least 5 products	Qprod1_a	Counts all positive responses.	Equals 1 if five responses given; 0 otherwise
Recent financial product choice	Qprod1_c	Identifies any product choice.	Equals 1 for any recent choice; 0 otherwise
Reliance on family and friends	QF3 and QF13	Identifies any instance of turning to family or friends to save money for them, or to help them to make ends meet.	Equals 1 for any instance; 0 otherwise

Source: OECD/INFE (2016)

Table A3: Computation of financial knowledge score

Topic	Question #	Discussion	Valuation
Time-value of money	QK3	Multiple choice and context specific, e.g., current rate of inflation.	1 for correct response; 0 otherwise
Interest paid on a loan	QK4	Open response to test understanding of interest on a loan.	1 for correct response; 0 otherwise
Interest plus principal	QK5	Open response to test applied numeracy.	1 for correct response; 0 otherwise
Compound interest	QK6	Multiple choice with 4 options. Question conditioned on correct response to QK5.	1 for correct response; 0 otherwise
Risk and return	QK7_1	True/false question.	1 for correct response; 0 otherwise
Definition of inflation	QK7_2	True/false question.	1 for correct response; 0 otherwise
Diversification	QK7_3	True/false question.	1 for correct response; 0 otherwise

Source: OECD/INFE (2016)

Table A4: Computation of financial behavior score

Behavior	Question #	Discussion	Valuation
Responsible and has a household budget	QF1 and QF2	Whether respondent has responsibility for money manageemt, and conditioned on a yes, whether household has a budget.	1 if personally or jointly responsible for money management [QF1=1 or 2] AND household has a budget [QF2=1], 0 in all other cases.
Active savings	QF3	Identifies various savings options for selection.	1 for any type of saving; 0 otherwise
Considered purchase	QF10_1	Scaled reaction: "Before I buy something I carefully consider whether I can afford it."	1 for a response of 1 or 2 on the scale; 0 otherwise
Timely bill payment	QF10_4	Scaled reaction: "I pay my bills on time."	1 for a response of 1 or 2 on the scale; 0 otherwise
Keeping watch of financial affairs	QF10_6	Scaled reaction: "I keep a close personal watch on my financial affairs."	1 for a response of 1 or 2 on the scale; 0 otherwise
Long term financial goal setting	QF10_7	Scaled reaction: "I set long term financial goals and strive to achieve them."	1 for a response of 1 or 2 on the scale; 0 otherwise
Choosing financial products	Qprod2 and Qprod3	Combines reactions to two statements: (i) "Tried to compare across providers." Includes considering alternatives or looking for alternatives but finding none. (ii) "Sought information or advice." Level 1 Includes information from the internet, sales personnel, friends or relatives, employer, newspaper, TV or radio. Level 2 includes information from financial pages of newspapers or magazines or best-buy information on the internet, or from professional financial adviser or broker.	2 if reaction to (ii) is Level 2; 1 if reaction to (i) is yes or reaction to (ii) is Level 1; 0 for no attempt to compare products or seek information or no recent product choice made.
Borrowing to make ends meet	QF12	Combines reactions to the following: <ul style="list-style-type: none"> • Borrowed from family or friends. • Borrowed from employer/salary advance. • Pawned something. • Borrowed from savings & loans club. • Took money from flexible mortgage account. • Borrowed against or withdrew from pension fund. • Used overdraft or line of credit. • Used credit card for cash advance or to pay bill. • Borrowed from a financial service provider (including bank, credit union or microlender). • Borrowed from an informal moneylender. • Used unauthorized overdraft. • Paid bills late or missed payments. 	1 if no problem making ends meet or no response; 0 for any yes reaction.

Source: OECD/INFE (2016)

Table A5: Computation of financial attitude score

Attitude	Question #	Discussion	Valuation
Time preference	QF10_2	Reaction to: "I tend to live for today and let tomorrow take care of itself."	1-5 points scale: 1=Strongly agree; 2=Agree; 3=Slightly agree; 4=Slightly disagree; 5=strongly disagree
Saving attitude	QF10_3	Reaction to: "I find it more satisfying to spend money than to save it for the long term."	1-5 points scale: 1=Strongly agree; 2=Agree; 3=Slightly agree; 4=Slightly disagree; 5=strongly disagree
Spending attitude	QF10_8	Reaction to: "Money is there to be spent."	1-5 points scale: 1=Strongly agree; 2=Agree; 3=Slightly agree; 4=Slightly disagree; 5=strongly disagree

Source: OECD/INFE (2016)

Table A6: First stage IV estimation results: Financial literacy score

	First stage
Income 2-3.5mil kip	0.308*** [0.070]
Income >3.5mil kip	0.286*** [0.094]
Secondary education	-0.174* [0.093]
Primary education	-0.354*** [0.102]
Age 30-60	0.196*** [0.072]
Age >60	-0.025 [0.116]
Male	-0.032 [0.059]
Self-employed	0.215** [0.099]
Paid employee	0.089 [0.125]
Disabled/student/retired	0.223 [0.168]
Rural area	0.078 [0.086]
% of district with income >2mil kip	-0.504*** [0.166]
Distance from bank (mins)	-0.002 [0.001]
Average literacy in district	0.898*** [0.086]
Better math	0.287*** [0.069]
Family shocks	0.131** [0.057]
Intercept	-0.002 [0.001]
R-squared	0.242
Number of observations	989

Note: Figures in brackets are standard errors. ***, **, and * denote significant at the 1%, 5%, and 10% statistical levels, respectively. Province dummies are included in all specifications.

Source: Authors' estimation.

Table A7. Financial Literacy Components Effect on Savings

	(1)	(2)	(3)
	Savings (formal & informal)	Formal savings previous year	Formal savings previous 2 years
Financial knowledge score	-0.004 [0.007]	0.008 [0.014]	0.007 [0.014]
Financial behavior score	0.068*** [0.007]	0.079*** [0.014]	0.059*** [0.014]
Financial attitude score	-0.013* [0.007]	0.049*** [0.013]	0.019 [0.013]
Income 2-3.5mil kip	0.024 [0.017]	0.103*** [0.032]	0.117*** [0.032]
Income >3.5mil kip	0.015 [0.021]	0.151*** [0.043]	0.202*** [0.045]
Secondary education	-0.007 [0.022]	-0.053 [0.053]	-0.036 [0.052]
Primary education	-0.025 [0.024]	-0.170*** [0.055]	-0.154*** [0.054]
Age 30-60	-0.013 [0.016]	0.085*** [0.030]	-0.009 [0.030]
Age >60	-0.001 [0.021]	0.159*** [0.050]	0.187*** [0.051]
Male	-0.005 [0.015]	-0.035 [0.027]	-0.025 [0.026]
Self-employed	0.012 [0.020]	0.108*** [0.040]	0.010 [0.043]
Paid employee	0.017 [0.026]	0.111** [0.052]	0.048 [0.055]
Disabled/student/retired	-0.148** [0.058]	0.050 [0.065]	0.007 [0.066]
Rural area	0.057*** [0.019]	-0.041 [0.035]	-0.024 [0.035]
R-squared	0.2319	0.1734	0.1428
N	989	989	989

Note: Figures in brackets are standard errors. ***, **, and * denote significant at the 1%, 5%, and 10% statistical levels, respectively. The dependent variable in column (1) is whether the respondent has any types of savings, that in column (2) is whether the respondent had formal savings in the previous year and in column (3) is whether he/she had savings in the previous two years or not. Province dummies are included in all estimates.

Source: Authors' estimation.

Table A8. Financial Literacy Compents Effect on Savings by Type (Marginal Effects)

	Multinomial probit estimator		
	No savings	Informal savings	Formal & informal savings
Financial knowledge score	0.002 [0.008]	-0.014 [0.015]	0.012 [0.013]
Financial behavior score	-0.069*** [0.007]	-0.011 [0.016]	0.081*** [0.014]
Financial attitude score	0.013* [0.007]	-0.060*** [0.014]	0.047*** [0.013]
Income 2-3.5mil kip	-0.023 [0.017]	-0.082** [0.035]	0.104*** [0.032]
Income >3.5mil kip	-0.013 [0.022]	-0.141*** [0.047]	0.155*** [0.043]
Secondary education	-0.004 [0.025]	0.035 [0.057]	-0.031 [0.052]
Primary education	0.014 [0.027]	0.125** [0.059]	-0.139*** [0.053]
Age 30–60	0.010 [0.016]	-0.104*** [0.033]	0.095*** [0.030]
Age >60	0.001 [0.021]	-0.152*** [0.053]	0.151*** [0.049]
Male	0.007 [0.015]	0.032 [0.029]	-0.039 [0.027]
Self-employed	-0.013 [0.020]	-0.101** [0.043]	0.114*** [0.038]
Paid employee	-0.016 [0.027]	-0.089 [0.057]	0.105** [0.051]
Disabled/student/retired	0.137** [0.057]	-0.200** [0.078]	0.063 [0.063]
Rural area	-0.056*** [0.019]	0.095** [0.038]	-0.039 [0.034]
N	966		

Note: Figures in brackets are standard errors. ***, **, and * denote statistically significant at the 1%, 5%, and 10% levels, respectively. The multinomial probit estimator is used. There are three groups: (i) no savings; (ii) only informal savings; and (iii) both formal and informal savings. We do not use the group of only formal savings because it has only 24 observations (versus 19 covariates in our model). Province dummies are included in all specifications.

Source: Authors' estimation.