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Does financial literacy inevitably lead to access to finance services? Evidence from rural Ghana

Martinson Ankrah Twumasi[1] **Yuansheng Jiang**[1*] **Pengcheng Wang**[2] **Zhao ding**[1] **Lady Nadia Frempong**[3] **Monica Owusu Acheampong**[4]

[1]College of Economics, Sichuan Agricultural University, Chengdu, China. E-mail: yjiang@sicau.edu.cn. *Corresponding author.
[2]College of Economics and Management, China Agricultural University, Beijing, China.
[3]College of Management, Sichuan Agricultural University, Chengdu, China.
[4]School of Management, University of Cape Coast, Cape Coast, Ghana.

ABSTRACT: *This study examined the determinants of financial literacy (FL) and its impact on access to financial services (AFS), using data collected from rural Ghana. A two-stage residual inclusion model is utilized to address the selection bias issue. The results showed that FL is affected by household heads' age, gender, education, asset ownership, homeownership, and economics education. The results revealed that FL is significant and positively related to AFS, but its square shows an inverse relation with saving mobilization. This indicated a non-linear relationship between FL and AFS. Moreover, we find that FL has a larger AFS impact for households with high-income and male household heads relative to their counterparts. The study recommended that the government can initiate the creation of a rural committee to educate rural residents on financial issues through radio broadcasting and meetings. Our findings highlighted the importance of FL on AFS in enhancing the welfare of rural households.*
Key words: *access to financial services, financial literacy, two-stage residual inclusion model, Ghana JEL codes: D91, C21, C26, D12.*

A educação financeira leva inevitavelmente ao acesso a serviços financeiros? Provas da zona rural de Gana

RESUMO: *Este estudo examina os determinantes da educação financeira (FL) e seu impacto no acesso a serviços financeiros (AFS), usando dados coletados na zona rural de Gana. Um modelo de inclusão residual de dois estágios é utilizado para abordar a questão do viés de seleção. Os resultados mostram que a FL é afetada pela idade, sexo, educação, propriedade de ativos, propriedade e educação econômica dos chefes de família. Os resultados revelam que FL é significativo e positivamente relacionado ao AFS, mas seu quadrado mostra uma relação inversa com a mobilização de poupança. Isso indica uma relação não linear entre FL e AFS. Além disso, notou-se que o FL tem um impacto maior de AFS para famílias com alta renda e chefes de família do sexo masculino em relação às suas contrapartes. O estudo recomendou que o governo pode iniciar a criação de um comitê rural para educar os residentes rurais sobre questões financeiras por meio de radiodifusão e reuniões. Nossos resultados destacam a importância do FL no AFS para melhorar o bem-estar das famílias rurais.*
Palavras-chave: *acesso a serviços financeiros, alfabetização financeira, modelo de inclusão residual em dois estágios, Gana.*

INTRODUCTION

The majority of the rural population in most countries worldwide depends on agriculture as a main primary occupation. Agriculture activities are not only seen as stakeholder's source of income for a sustainable livelihood but also contribute to economic growth because it contributes to national income, serves as a source of food and raw material supply, and an avenue for employment and food security assurance. However, despite the benefit derived by agriculture core players (farmers), mostly rural dwellers, they remain poor citizens in developing countries like Ghana (ATAKORA, 2016). This, in part, explains why the majority of the youth are neglecting agriculture, and even some farmers are abandoning cropland for off-farm employment. The inability of most rural dwellers to escape the vicious cycle of poverty could be attributed to the low access to financial services (AFS), colossal debt due to low-income generation, and improper financial management (GREENSPAN, 2005; KOOMSON et al, 2020; NORVILITIS et al., 2006). With these issues raised, it is worth investigating the determinants of access to financial services of Ghanaian rural dwellers to curtail their financial services' hindrances.

A nation whose citizens' AFS, especially domestic savings, is low faces serious economic

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problems if it encounters difficulties to access foreign capital to finance key developmental projects (REWILAK, 2017). For example, growth theories have shown that it is unnecessary to finance investment without savings, which will enhance a country's development. Therefore, to maintain sustainable growth in a nation, internal savings are essential since it positively affects economic growth (JAGADEESH, 2015; OLADIPO, 2010). Again, at the micro-level, participating in savings, access to credit and insurance might cause an improvement in the well-being of the poor in general and of women in particular (VONDERLACK & SCHREINER, 2002).

The level of saving rate in Ghana has always remained low; thus, not risen above an average of 20 percent since 1970 (BAIDOO et al. 2018). According to the WORLD BANK, (2015) report, only 0.2 percent represent Ghana's gross domestic savings (as a percentage of GDP), lower than the sub-Saharan African average of 15.9 percent and far lower than neighboring African countries. According to the WORLD BANK GROUP, (2016) report, approximately 41% of the people living in rural areas in Ghana have access to finance. Looking at the impact of AFS on economic growth, it is advisable examining the determinants of AFS and recommended some policy implications in developing countries such as Ghana, where AFS is low.

From previous studies (COLE et al. 2011; JAPPELLI et al. 2013; LUSARDI & MITCHELL, 2007; MITCHELL & LUSARDI, 2015; VAN ROOIJ et al. 2011), lack of financial education might be the cause of rural households low demand for financial services including holding savings or transaction account, insurance account, borrowing and investing in the financial market. For instance, ALESSIE et al. (2011) study in the Netherlands and MITCHELL et al. (2015) study in America revealed that financial literacy (FL) leads households to make sound and informed investment decisions that lead to future income and; consequently, economic growth. In Indonesia and India, COLE et al. (2011) reported that people's knowledge of financial products influences their financial services participation. Moreover, making a viable financial decision on what to save or invest, where to save or invest, the kind of financial services to consider is difficult; and therefore, a certain degree of financial literacy is required (LUSARDI & MITCHELL, 2007; MILLER et al., 2009)

While many studies have investigated the relationship between financial literacy and AFS in developed countries, surprisingly there are few studies on this topic in developing countries, especially rural households (core players of sustainable agriculture). The study has three main aims. First, we examined the impact of FL on AFS. Second, we found out whether FL inevitably leads to AFS, i.e., whether a non-linear relationship exists between these two variables. Finally, we examined the heterogeneous effect of FL on AFS by gender composition and household income levels.

We contributed to rural development literature in several ways. First, this study is among the few to investigate the AFS impact of FL in a developing country, particularly rural householders. The reason is that improving rural dwellers' financial literacy and access to financial services will enable them to enhance their access to financial services; hence, unblocking development prospects for disadvantaged segments of the population and depresses income inequality (PARK & MERCADO, 2018). Second, we analyzed the impact of FL on the intensity of AFS, by focusing on the number of financial services accessed by householders. Third, we reported out whether FL inevitably leads to AFS, i.e., whether a non-linear relationship exists between these two variable. Previous studies (ANDOH et.al. 2015; XU et al. 2019) have concluded that financial literacy leads to AFS. However, it is inappropriate to assume that financial literacy promotes AFS since there may be a non-linear relationship between these two variables. Fourth, the study carried out a disaggregated analysis by examining the financial literacy effect on AFS by household income and gender composition levels. Prior studies have shown that due to low female participation in household decision-making, they are mostly marginalized regarding access to financial services in developing countries like Ghana (DUVENDACK & MADER, 2020; KOOMSON et al. 2020). Similarly, studies have shown wealth creation positively relates with AFS. However, where FL is high among females and low-income earners, they may be willing to increase their access to financial services. Thus, high-income householder will participate in financial services than low-income householder. Therefore, the disaggregated analysis of financial literacy effect on AFS by household income level and gender composition level is important. Finally, we employed an econometric method that accounts for endogeneity problems to ensure consistency in our findings.

The rest of this paper is arranged as follows: the theoretical analysis is developed in Section 2. Section 3 presents the methods and material of the study, whereas Section 4 the empirical results and discussion. Finally, in Section 5, we concluded and proposed policy implications.

Theoretical analysis

The life cycle hypothesis (LCH) can be attributed to the pioneering work of FRIEDMAN, (1957) and MODIGLIANI, (1954) who also elaborated on the permanent income hypothesis. The theory, from microeconomic indicates that a rational and sound person will reserve part of his/her income for future consumption. According to the LCH, there is an expectation that an individual organizes his or her finances and consumption patterns in ways to keep marginal utility over a lifetime (LUSARDI, 2014). Income patterns should be considered then, individuals may patronize financial services, that is, accumulating wealth in the current period to encourage smooth consumption at the expense of a fall in income in the future (ANDO, 1963). Considering the connection of financial literacy and one's ideology to participate in financial services, a logical basis or model can be deduced from the life cycle income hypothesis on how financial decisions are made over a period of time. The life cycle income hypothesis posits individuals have the financial knowledge required (financially literate) as to when to consume and save money for the sustainability of marginal utility throughout their lifetime (LUSARDI, 2014).

Theoretically, there is no precise interaction mechanism of financial literacy on access to financial services. First, financial literacy impact on AFS may be positive. The reason is that financial literacy broaden individuals' financial knowledge and understanding; therefore, encouraging them to undertake a retirement plan such as saving and investment (AFS) to curtail future financial challenges (ALESSIE, 2011; LUSARDI, 2008; VAN ROOIJ, 2011). Conversely, financial literacy may have negative impact on AFS because according to DEATON, (1990), LCH might be of limited use in developing countries. Individuals turn to financial services at frequent intervals to smooth income, rather than accumulate or invest for retirement. Again, rural dwellers' (predominately farmers) expected income may fall below average due to unfavorable weather conditions and other inevitable consumption expenditures, affecting ones' financial services accessibility. For example, in developing countries like Ghana, most farmers' climate change adaptation methods are low, making it difficult to increase production as well as income. Moreover, the head of a household cannot have access to financial services due to high dependency ratio or financial exclusion (KOOMSON, 2020), i.e., all income generated is used as household expenditure rather than farm expenditure to improve productivity.

From the above discussion, there is a tendency of non-linear relationship between financial literacy and AFS, which may not have received sufficient attention in previous studies. Therefore, this paper determined the impact of financial literacy on access to financial services and find out whether the relationship between financial literacy and AFS is a U-shape (non-linear).

MATERIALS AND METHODS

Econometrics model

The study seeks to find out the impact of financial literacy on AFS. We argued that the FL variable is endogenous to AFS because of some reverse causality effect. For example, the household heads who are financially literate will be more likely to access financial services. Again, AFS of household heads can also improve financial literacy levels through bankers and other financial consultants' advice. Also, AFS decision by households/householders is not randomly distributed; hence, causing selection bias. Thus the focal variable might be considered as an endogenous variable. We employed a two-stage residual inclusion (2SRI) approach to address the financial literacy variable's endogeneity issue. The 2SRI approach has been applied in recent studies (KUMAR *et al.*, 2020; MA & ZHU, 2020; NIE; et al, 2020; TERZA, 2018). Here, we assumed that the *i* th household head would improve his/her financial education behavior after analyzing the expected utility gain derived from financial literacy. The utility difference can be express by a latent variable $FL^*_i = U^*_{i1} - U^*_{i0} > 0$ as ; where U^*_{i1} and U^*_{i0} represent financial literate and illiterate, respectively. This latent variable, FL^*_i, is determined by observable householder/household factors, other characteristics and the error term. It is expressed as;

$$FL^*_i = \alpha_i X_i + \beta_i I_i + \mu_i \; FL_i = \begin{cases} 1 \; if, \; FL^*_i > 0 \\ 0 \; if, \; otherwise \end{cases} \quad (1)$$

Where FL^*_i represents the probability of being FL; thus, a binary variable FL_i which mean 1 for financially literate (whether the respondent score is above the median financial literacy score) and 0, otherwise; I_i represent an instrumental variable (IV), which is used for 2SRI model identification. X_i is vector of control variables (see Table 1), α_i *and* β_i are the vector of parameters for the control variables that need to be estimated and μ_i is a random disturbance term.

In stage two of 2SRI, we estimated the outcome variables (access to financial services (AFS) and number of financial services (NAFS) accessed

by householder *i*) effect of FL using two econometric models (Probit and Poisson) because of the dependent variables' nature. The pobit model is for the binary nature of the AFS variable, while the count nature of the AFS is for the Poisson model. These models are specified as follows;

$$AFS_i^* = \gamma_i FL_i + \emptyset_i X_i + \varphi_i Residual_i + \varepsilon_i, \qquad AFS_i = \begin{cases} 1\ if,\ AFS_i^* > 0 \\ 0\ if,\ otherwise \end{cases} \quad (2)$$

$$NAFS_i^{\vartheta} = \vartheta_i FL_i + \tau_i X_i + \pi_i Residual_i + \omega_i \quad (3)$$

where AFS_i^* refers to the probability that a household head chooses to access financial services. It is represented by an observed binary indicator AFS_i (1 = financial service us$NAFS_i^{\vartheta}$d 0 = nonusers); refers to the number of financial services accessed by a household head. $Residual_i$ is a residual term predicted after equation 1 estimation which is in cooperated in equations (2) and (3). This process helps address the endogenous issue resulting from unobserved factors that may affect the estimated outcome result consistency (YING, 2019). γ_i, $\varnothing_i$, φ_i, ϑ_i, τ_i, and π_i are parameters to be estimated. ε_i and ω_i are error terms.

Finding an instrument for empirical research is a challenge. The instrument must be correlated with the endogenous explanatory variable but uncorrelated with the dependent variable and error term (BURGESS, 2006). Following XU et al. (2019), we used the variable "economics education (whether the respondent knows someone (relative/ friend) with economics education)" as an instrument for the householders' financial literacy level equation. The researcher chooses this instrument because individuals' FL level is affected through interaction with others (LUSARDI, 2013). People with economics education are known to be financially proficient due to their understanding and knowledge of financial indicators and fundamentals (BUCHER-KOENEN, 2011). Again, we tested the validity of the IV using the Pearson correlation method (see Table 8).

Problems confrontation index

Confronting problems that serve as constraints to AFS among the rural dwellers were further explored in this study using the problem confronting index (PCI). The use of the PCI is considered as a vital tool for measuring the severity of problems and constraints (ANKRAH TWUMASI; JIANG, 2021). The problem confrontation score is achieved by a four-point rating scale after following Roy et al. (2014). Also, weights were assigned for each response, including high confrontation=3, medium confrontation=2, low confrontation=1, and 0 for not at all. The respondents were questioned on 8 selected problems they think are hindering their AFS and were to reply accordingly. We then estimated each respondent's problem confrontation score. The possible score range for 8 selected problems lines within 0 (zero) to 24. The value '0' indicates no problem confrontation and high problem confrontation in access to financial services was assigned '24'. The formula below was used to calculate the PCI to identify the biggest confronting problem.

$$PCI = Ph \times 3 + Pm \times 2 + Pl \times 1 + Pn \times 0 \quad (3)$$

where *Ph* means the problem is high; *Pm* means the problem is medium; *Pl* means the problem is low; *Pn* means no problem at all. Thus, the range of each individual's PCI score could be from 0 to 1716, where 0 indicates that there is no problem confrontation at all and 1716 shows a high problem confrontation.

Defining of selected model variables

The study focuses on the impact of financial literacy on AFS among rural householders in Ghana. Following the definition of financial inclusion elaborated by the World Bank and existing literature, we developed a measurement for AFS, the dependent variable. The World Bank suggested that a household or individual is considered financially included when they have access to affordable financial products, credit, savings and current account, and insurance (WORLD BANK, 2018). This definition is also consistent with the macroeconomic literature, which has often considered measures such as banked population, access to credit, and access to insurance as the core pillars of financial inclusion (PARK, 2018). Based on the above financial inclusion explanation, the author uses three services (access to a savings account, credit, and insurance) to measure AFS status in this study. The respondents were asked to provide "Yes" (1) or "No" (0) response to the three questions; whether they have participated in these three services in the last 12 month. AFS was measured in two categories; first, the AFS variable was set as a binary variable; thus, one (1) if the household has access to at least one of the three financial services and zero (0) otherwise. Second, we measured the AFS as a variable scaled between 0 and 3, i.e., the respondent's number of financial services accessed. We used this strategy to measure the intensity of the respondent's AFS status.

This study's independent focal variable was financial literacy, which was measured by a set of 7 questions following previous literature (see Table 7) (ALMENBERG, 2015; ANDOH, 2015; LUSARDI, 2011a; NIU, 2018). A possible total score from 0-7

was recorded for each respondent. We transformed the scores into a dichotomous variable; thus, one (1) for a score higher than the median score of the total FL score, and zero (0) for a score below the median score of the total FL score. This method has been employed by previous scholars (AKOTO, 2017; WACHIRA, 2012).

Again, other control variables were added to the focal variable to ensure accuracy of the study. These control variables which have been used in previous studies (ADDAI, 2017; ALMENBERG, 2011; IJIOMA, 2015; LUSARDI, 2014; OBALOLA, 2018) and also available in our data collection include; demographic and socioeconomic factors (e.g., age, gender, education, marital status, household size) and other factors such as off-farm work, member of an association, urban, Children, farm size, and years of farming experience (see Table 1 for further clarification).

Data source

The study was conducted in the Eastern region of Ghana. The targeted population in this study was rural residents. Interview schedules and questionnaires were used for the collection of the data from April to June 2020. An in-depth interview was conducted because of the complex nature of the questionnaire. A pre-testing of the questionnaire was done to ensure clarity of the questions and the respondents' interpretation of responses. The survey data questionnaires covered information on socioeconomic and demographic characteristics, farm characteristics such as age, gender, farm size, cooperative membership, total household income (farm and other sources of income), financial literacy, access to financial services and other variables that contribute to the aim of the study.

The sample was drawn using the multi-stage technique. In the first stage, four regions, namely the Northern region, Brong-Ahafo (BA) region, Central region, and Eastern region located in northern, central, southwestern, and southeastern parts of Ghana, respectively, were selected. These regions are considered as major agricultural territories in Ghana (see Figure 1). We sleceted a district randomly from the regions selected in the stage two. The Savannah region selected district was East Gonja, Atebubu Amantin District for the Bono East region, Ekumfi District for the Central region and the Eastern region selected district was Kwahu Afram Plains District. In stage three, three (3) communities/villages were randomly selected from each selected district. The East Gonja District had Yankanjia, Akyenteteyi and Salaga as its three selected communities; Atebubu Amantin District selected communities were Asempanye, Dobidi Nkwanta and Atebubu; Essarkyir, Otuam, and Kontankore were from the Ekumfi District; the Kwahu Afram Plains District had Tease, Bumpata, and Ahiatroga as its selected communities. These communities were selected based on the availability of financial institutions in those areas and easy accessibility of farmers due to farmers' association.

According to the WORLD BANK GROUP, (2016) report, approximately 41% of the people living in rural areas in Ghana have access to finance. Based on this report, we estimated our sample size by employing JAMES E. BARTLETT II el at (2001) sample size estimation approach. The approach assumes a 95% confidence level and 5% margin of error and it is expressed as:

$$\frac{S^2(x)(y)}{(E)^2} = \frac{1.96^2(0.41)(0.59)}{0.05^2} = 379.30 \quad (1)$$

where n = sample size, x = access to transaction account population proportion, y = the population's proportion without transaction account, S = the number of standard deviation for a chosen confidence interval level, E = error margin. To ensure a fair respondents distribution within the selected communities, we raised sample size to 600. Therefore, we chose appropriately 40-60 rural households from each community using the size of community. Finally, 572 respondents were made available for the study's analysis due to errors in some of the questionnaires. Data was edited and coded to ensure accuracy, validity, uniformity, consistency, and completeness.

RESULTS AND DISCUSSION

Descriptive analysis

Table 1 shows the characteristics of the variables used in the analysis of the study. From the table, the 47% have access to financial services, and the average number of financial services accessed by the sampled group is 1.42. About 33% of the respondent are financially literate (i.e., had a score above the financial literacy median score). The average financial literacy score is 2.63. The mean age of the respondent are approximately 42. While 69% of the respondents are male, 71% are married. About 27% of the respondents have attained high school or higher education. The average family size and number of children of a household in the sampled group are approximately 7 and 5, respectively. Asset ownership, homeownership, and extension services have a percentage record of 78%, 39%, and 41%, respectively. The average distance from the

Table 1 - Socioeconomic, Demographic and other characteristics of the respondents.

Variables	Description	Mean	Std. Dev.
AFS	1 if the household has access to at least one of the three financial services, 0 otherwise	0.47	0.50
Number of AFS	The number of financial services accessed by a respondent	1.42	0.97
Fiancial literacy	1 if the respondent is financially literate (whether the respondent score is above the median financial literacy score), 0 otherwise	0.33	0.42
Financial literacy(FL)	Financial literacy score	2.63	1.79
Age	Age of household head (years)	41.72	12.21
Gender	1 if household head is male, 0 otherwise	0.69	0.46
Marital status	1 if respondent is married; 0 otherwise	0.71	0.80
Education	1 if the respondent has high school or higher education, 0 otherwise	0.27	0.49
Household size	Number of members in a household (persons)	6.61	3.21
Number of children	Number of children (less than 18years) in a household	3.59	1.49
Asset ownership	1 if the respondent owns a TV/radio, 0 otherwise	0.78	0.53
Homeownership	1 if the respondent owns a house, 0 otherwise	0.39	0.49
Extention services	1 if the respondent has access to estension services; 0 otherwise	0.41	0.47
Distance	Distance from the respondent house to the nearest financial institution (kilometers (km))	2.14	0.81
Economics education	1 if the respondent knows someone (relative/friend) with economics education ; 0 otherwise	0.24	0.41

Source: survey results, 2020.

respondent house to the nearest financial institution is 2.14 km. Finally, only a few percentages (27%) of the sampled size relates to someone with an economics education.

Table 2 summarizes the differences between financial literacy and illiteracy by some key variables. Compared to financially illiterates, the results reveal that access to finance and the numbers of financial services accessed is profound among the literate household heads. This indicates that there is a high possibility for literate farmers to have access to financial services than their illiterate counterparts. This

Table 2 - Financial literate and illiterate mean differences of selected variables.

Variables	Literate	Illiterate	Mean differences
AFS	0.56 (0.46)	0.38 (0.45)	0.18***
NAFS	1.73 (0.83)	1.11 (0.91)	0.62**
Age	38.32 (17.23)	45.12 (18.61)	-6.80*
Gender	0.76 (0.51)	0.62 (0.49)	0.14*
Marital status	0.74 (0.49)	0.68 (0.48)	0.06*
Education	0.39 (0.42)	0.15 (0.36)	0.24***
Household size	6.12 (3.69)	7.10 (3.52)	-0.98
Number of children	3.84 (1.06)	3.34 (0.98)	0.50
Asset ownership	0.82 (0.56)	0.74 (0.52)	0.08*
Home ownership	0.46 (0.49)	0.32 (0.44)	0.14*
Extension services	0.45 (0.32)	0.37 (0.40)	0.08
Distance	1.46 (0.88)	2.82 (1.03)	-1.36**
Economics education	0.31 (0.48)	0.17 (0.39)	0.14**

Source: survey results, 2020. *, **, and *** represent statistical significance at 10%, 5% and 1% alpha levels, respectively. All numbers in parentheses are robust standard errors.

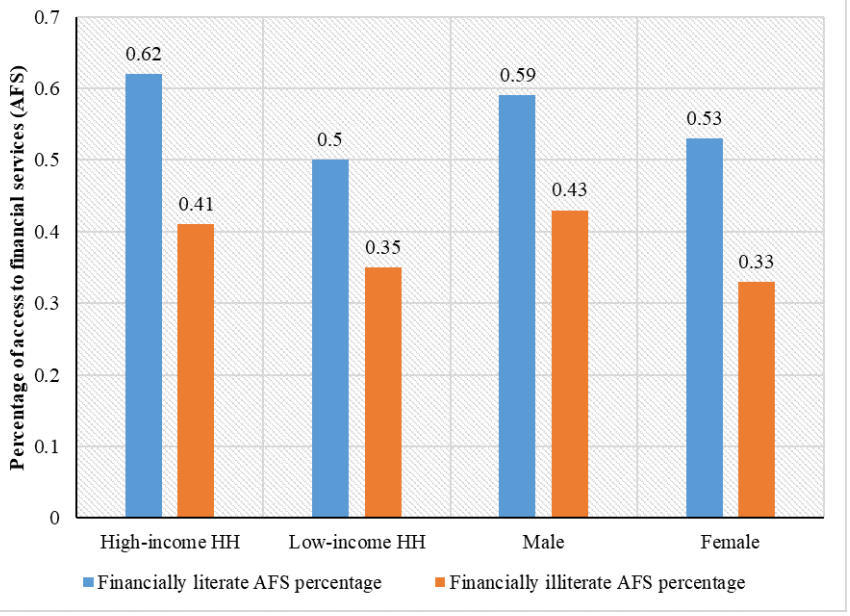
finding is echoed in figures 1 and 2, which shows that access to financial services and number of financial services accessed are substantial among those who are financially literate compared with those who are illiterate even at different levels. The young, males, and educated household heads are more likely to be financially literate than their counterparts. Compared to financial literates, illiterate have less connection with economics education and live far away from a financial institution. Most household heads who own houses and assets are financially literate than those without these substances. However, these findings should be interpreted with caution because this is a simple mean differences comparison that ignores confounding factors, i.e., observed and unobserved characteristics).

Concerning the problem confronted by the rural farm households in terms of AFS, we used the the PCI to measure the extent of severity. According to the rank order in table 3, the respondents identified a lack of understanding of financial terminologies and products as the central problem in the study areas. Due to the low level of education in rural areas (ATAKORA, 2016), individuals find it difficult to understand financial terms and conditions and, therefore, unwilling to participate in the financial market. Insufficient money was pointed out as the next major problem. Thus, with low income that may not even satisfy the household, individuals may think it is unnecessary to engage in financial services.

The third problem was the lack of trust in financial institutions (FIs). After a series of fraudulent FIs cases in Ghana, most people do not trust the FIs anymore. Moreover, due to low education, most people feel that Fis would cheat them; therefore, they are unwilling to patronize Financial Services. The least among the problems was risk rationing. Many people failed to participate in the financial market because they fear that their demand for credit would be aborted due to the lack of collateral demanded by lenders (FIs).

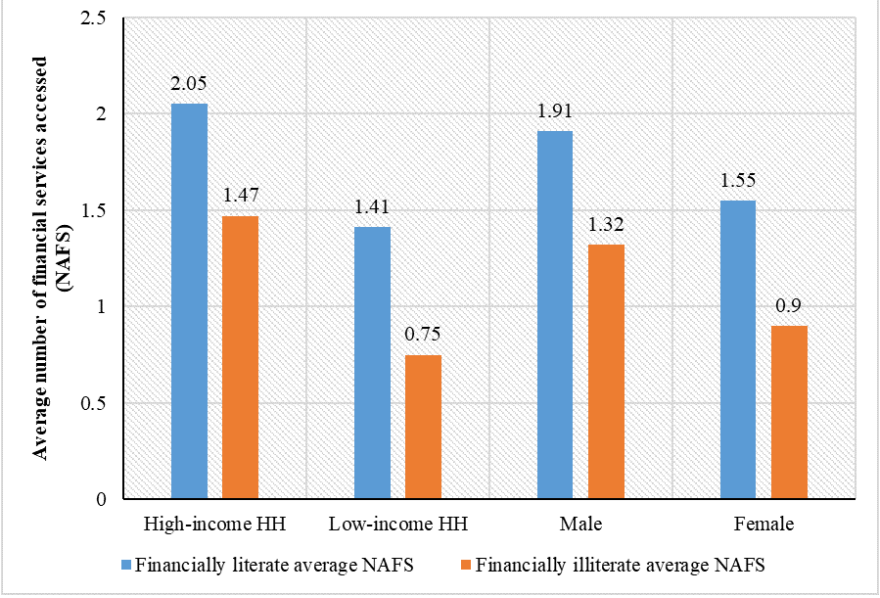
Empirical analysis

The report of the 2SRI model estimates are presented in table 4. Due to the straightforwardness of the Probit and Poisson models' coefficient values, we estimated the marginal effect values for easy explanation. As shown in Table 4, the residual terms in columns 3 and 4 are significant, suggesting the presence of endogeneity issue rising from financial literacy due to unobserved heterogeneities that may cause inconsistency in our estimation.



Note: AFS= Access to financial services, HH= Household.

Figure 1 - Distribution of AFS percentage by household income level status and gender Forward all figures .tiff with at least 300 dpi.



Note: NAFS= Number of financial services accessed, HH= Household.

Figure 2 - Distribution of average NAFS by household income level status and gender.

Determinants of financial literacy

The factors that influence financial literacy are presented in table 4, column 2. Since the study's focus is on how FL affects AFS, detailed explanations in this section is reserved but will be made available on request. The results reveal that the marginal effect of variables including gender, education, asset ownership, homeownership, and economics education (IV) positively and significantly influence FL; however, the age variable is significant and negative. For example, homeownership's positive and significant marginal effect suggests that house owners' financial literacy is prevalent. Owning a house can be a proxy for wealth. Financial education or management skills is needed to acquire knowledge on how, why, and where to invest in increasing income or creating wealth. Therefore, wealthy people are more likely to be financially literate. The findings of MITCHELL

Table 3 - Problem Confrontation Index (PCI) computation.

		----------Extent of problem confrontation---------					Rank
Problem		High (3)	Medium (2)	Low (1)	Not at all (0)	PCI	Order
1.	Distance to nearest FI is far	97	194	227	54	906	6
2.	Lack of trust	273	94	205	0	1212	3
3.	Religious reason	120	241	211	0	1053	5
4.	Insufficient money	219	279	75	0	1288	2
5.	A family member has one	77	156	256	83	799	7
6.	Lack of documentations	129	374	69	0	1204	4
7.	Do not understand FIs terminologies	233	301	38	0	1339	1
8.	Risk rationing	85	107	289	91	758	8

Source: Survey results, 2020.

Table 4 - 2SRI model estimate for the effect of financial literacy on access to financial services.

Variables	First stage	Second stage	
	Financial Literacy (0/1)	Access to financial services (AFS)	Number of financial services accessed (NAFS)
Financial Literacy		0.571 (0.071)***	0.066 (0.035)***
Financial Literacy^2		-1.064 (0.048)***	-0.547 (0.042)***
Age	-0.007 (0.002)*	-0.184 (0.055)*	-0.051 (0.031)
Gender	0.012 (0.007)**	0.035 (0.019)**	0.145 (0.063)**
Marital status	0.007 (0.002)	0.064 (0.1152)	0.024 (0.019)
Education	0.013 (0.002)**	0.303 (0.184)**	0.127 (0.051)**
Household size	-0.028 (0.005)	-0.198 (0.127)**	-0.071 (0.032)
Number of children	0.156 (0.097)	0.002 (0.000)	0.016 (0.002)
Asset ownership	0.029 (0.013)*	0.088 (0.021)	0.022 (0.016)
Home ownership	0.057 (0.014)**	0.111 (0.036)**	0.004 (0.000)**
Extension services	0.044 (0.019)	0.022 (0.017)*	0.005 (0.004)
Distance	-0.051 (0.027)	-0.090 (0.057)***	-0.059 (0.013)*
Economic education	0.037 (0.012)**		
Residuals		0.012 (0.003)*	0.124 (0.037)*
Log-pseudo likelihood	-1387.765	-967.834	-2691.441
Regional dummies	Yes	Yes	Yes
Observation	572	572	572

Source: survey results, 2020. *, **, and *** represent statistical significance at 10%, 5% and 1% alpha levels, respectively. All numbers in parentheses are robust standard errors.

& LUSARDI, (2015) and MONTICONE, (2010) are mirrored in this study. Also, the IV variable, economics education, is positive and statistically significant, suggesting that respondents connected with people who have economics education are more likely to be financially literate. People with economics education are known to be financially proficient due to their understanding and knowledge of financial indicators and fundamentals (BUCHER-KOENEN, 2011). Therefore, people who connect with these individuals with an economics education are likely to gain financial knowledge through constant communication or consultation; thus, there is a high tendency of peer influence (THOMAS, 2018).

Effect of financial literacy on access to financial services

As shown in table 4, financial literacy and its square are all significant at 1% level and depicts an opposite sign in all models, that is, financial literacy and its square have positive and negative signs, respectively. The result shows a non-linear relationship between the financial literacy level and outcome variables (AFS and NAFS), indicating that financial literacy does not inevitably lead to AFS or NAFS. The possible explanation to this result can be attributed to the following. On the one hand, a higher acquisition of financial knowledge to boost financial literacy causes one's ability to have a future financial plan, thereby willing to participate in financial services (ALESSIE, 2011; LUSARDI, 2011). Looking at the unforeseen future circumstances and taking into consideration precautions, individuals are encouraged to plan ahead. Thus, a household may save some money, participate in insurance policies or take loans to improve household welfare. On the other hand, there is much uncertainty about whether businesses carried on by these respondents will result in higher income and increase their propensity to participate in the financial market. For example, in developing countries, individuals often save small amounts at frequent intervals to smooth income, rather than accumulate or save for retirement, making the savings theories less significant (DEATON, 1990). Moreover, unfavorable weather and other uncontrollable expenses may cause a decline in household income, which includes farm income, limiting individuals' access to financial services. Without sufficient household income, households are likely to be credit constraint (VISHWANATHA; EULARIE, 2017), reduce savings mobilization (refuse to hold a transaction account) (TWUMASI, 2019) and less likely to take insurance policies (KOOMSON et. al. 2020); thus, less likely to have AFS.

In addition, the other control variables impact on AFS and NAFS are also presented in table 4. While gender, education, homeownership, and extension services positively and significantly impact AFS and NAFS; age, household size, and distance to the nearest financial institution depict a negative and significant impact. The marginal effect of age is negative and significant, implying that compared with young household heads, elderly household heads are less likely to have AFS. This result supports the life cycle hypothesis of savings theory, which argues that individuals are more likely to saves (AFS) at a younger age and consume their savings as they grow (ANDO, 1963). In the same manner, the gender variable and the outcome variables nexus is statistically significant and negative. This means that male household heads AFS and NAFS are profound compared with female household heads. In developing countries like Ghana, financial decisions (e.g., whether to hold a transaction account or have access to credit) are determined by the household's males, giving the females less privilege to participate in the financial market (FLETSCHNER, 2014).

The education variable's positive marginal effect value implies that educated household heads are more likely to have access to financial services. This result implies that having acquired some level of formal education improves one's understanding and importance of financial services. This result is consistent with the studies of ADDAI, (2017) and BAIDOO, (2018) but disagrees with the study of LAURINE, (2013).

On the contrary, the probability of having AFS reduces for households with large household sizes and the result is robust. This implies that households having larger family size AFS is low because of the high expenditure arising from the high dependency ratio. These households are mostly marginalized in accessing credit. They hardly save or take any insurance policies due to low-income generation. These findings are consistent with (ADDAI, 2017; CHANDIO et al., 2018) studies but contradict that of LIN et al. (2019), which argued that larger household size (adults) increases household income through they wages and salaries; therefore, they participate in the credit market.

Also, there is a positive and significant relationship between homeownership and outcome variables (AFS and NAFS). This reflects that household head who owns a house possibility to have access to finance is higher than their counterparts who do not own a house. Owning a house indicates that the farmer is wealthy; thus, the farmer may be likely to diversify his/her household resources by patronizing financial services. This finding is consistent with the study of SHIFERAW, (2017) and DUVENDACK, (2020), which reported financial institutions are likely to offer their services to creditworthy households.

The results further reveal that the extension services variable's marginal effect is significant and positive, suggesting that farmers with access to extension services are more likely to increases their access to financial services and the number of financial services accessed. During extension visits, extension officers educate farmers about the benefit gains through financial services patronization. Also, access to financial services may help farmers increase farm productivity and revenue by applying the techniques given by the extension staff; hence, they are more likely to participate in financial services. The result is in line with WOSSEN, (2017) and ANKRAH TWUMASI et al, (2019) findings. Finally, the distance variable's marginal effect value is significant and negative, suggesting that household heads whose resident is far from financial institutions are less likely to have access to financial services. According to KOOMSON, (2020), financial exclusion is prevalent among rural dwellers whose residents are far from financial institutions.

Disaggregated analyses by household income level and gender compositions

The study analyzed the disaggregated effect of FL on the outcome variables (AFS and NAFS) by gender composition and household income levels to gain further insight. The results are presented in table 5. Here, household income is divided into low and high-income households. Those whose per capita household income is above the median per capita household income are referred to as high-income households, while low-income households are those whose per capita household income is below the median. The marginal effect values are used for the interpretation in the section.

The results depict that FL impact on AFS and NAFS is positive and significant for high-income households; however, it was insignificant in terms of low-income households. This implies that the role of income in the effect of FL on access to financial services is very essential. High-income households can diversify their income by buying shares and bonds, holding a transaction account and many others LENG et al, (2020). These households might also consider insurance policies to protect their properties NUNOO, (2014). Also, financial institutions might be willing to offer them credit;

Table 5 - Impact of financial literacy on AFS and NAFS by household income level and gender composition.

	---------Second stage of AFS (Probit model)---------				----------Second stage of NAFS (Poisson model)----------			
Variable	Male	Female	High-income household	Low-income household	Male	Female	High-income household	Low-income household
Financial Literacy	0.031 (0.012)*	0.012 (0.007)*	0.121 (0.090)**	0.018 (0.015)	0.072 (0.034)**	0.028 (0.013)*	0.078 (0.031)*	0.021 (0.009)
Financial Literacy^2	-0.073 (0.019)*	-1.082 (0.147)**	0.313 (0.031)	-0.034 (0.011)	-0.056 (0.024)*	-0.005 (0.001)**	0.029 (0.008)	-0.016 (0.007)
Age	-0.074 (0.027)***	-0.021 (0.015)	0.028 (0.014)**	-0.116 (0.035)	-0.001** (0.000)	-0.016 (0.003)	-0.033* (0.017)	-0.014** (0.005)
Gender			0.046 (0.018)*	0.014 (0.012)*			-0.014*** (0.009)	-0.011* (0.005)
Marital status	0.009 (0.001)*	0.063 (0.094)	0.117 (0.012)*	0.031 (0.015)	-0.052 (0.014)	0.033 (0.016)	0.047 (0.007)	0.028 (0.019)
Education	0.032 (0.018)**	-0.047 (0.012)*	0.042 (0.051)**	0.005 (0.001)*	-0.021 (0.019)	0.009 (0.003)	-0.039* (0.019)	-0.034 (0.011)
Household size	-0.131 (0.053)	-0.053 (0.018)*	0.089 (0.034)*	-0.043 (0.021)**	-0.004** (0.002)	-0.025** (0.013)	-0.029* (0.018)	-0.011** (0.007)
Number of children	-0.116 (0.053)	-0.632 (0.242)*	0.049 (0.015)	-0.071 (0.045)	-0.049* (0.018)	-0.027** (0.015)	-0.010* (0.002)	-0.003 (0.001)
Asset ownership	-0.146 (0.075)	-1.380 (0.183)*	-0.055 (0.019)*	-0.031 (0.014)**	-0.033* (0.019)	-0.018* (0.012)	-0.037* (0.019)	-0.015 (0.007)
Home ownership	0.153 (0.055)**	0.018 (0.006)*	0.013 (0.109)***	0.031 (0.007)*	-0.057** (0.024)	-0.022* (0.010)	-0.021** (0.011)	-0.013* (0.005)
Extension services	0.018 (0.007)*	0.011 (0.004)	0.017 (0.004)*	0.061 (1.098)	-0.032* (0.009)	-0.011 (0.0172)	-0.037* (0.0329)	-0.015** (0.0137)
Distance	0.023 (0.011)**	0.066 (0.026)	0.016 (0.002)	0.054 (0.024)	0.076* (0.021)	0.011 (0.004)	-0.023** (0.011)	-0.015** (0.013)
Residual	0.638 (0.159)**	0.153 (0.680)*	0.442 (0.062)***	0.091 (0.182)*	-0.054 (0.018)	0.131 (0.077)	-0.089* (0.042)	-0.062* (0.019)
Log-pseudo likelihood	-1387.765	-967.834	-2691.441	-554.789	-1101.991	-670.142	-778.092	-2729.802
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	395	177	274	298	395	177	274	298

Source: survey results, 2020. Asterisks *. ** and *** represent significant levels at 10%, 5% and 1% respectively. All numbers in parentheses are robust standard errors. Reference region is Northern.

hence, they patronize the credit market (CHANDIO; JIANG, 2018).

The disaggregated analysis by gender composition revealed a non-linear relationship between FL and AFS and NAFS for male and female household heads. This indicates that FL is likely to increase access to financial services for both male and female household heads, but its impact on outcome variables will fall at some point in time. However, FL impact on access to finance for male household heads are profound compared with their counterpart. The reason is that women are marginalized when it comes to household financial decisions in many developing countries, including Ghana. Therefore, even with their financial education, their participation in the financial market is low. This finding is consistent with previous studies' results (COLEMAN, 2000; MMASA, 2017).

Robustness test analyses

The method employed in estimating the impact of FL on AFS reveals that the results obtained are robust. However, since measurement errors can influence table 4 results, a strategy to correct those errors is employed. Thus, the financial literacy variable is replaced by a continuous variable, the respondents' actual FL scores, and the outcome variables (AFS and NAFS) are regressed on independent variables using the IVProbit and IVPoisson method. As

Table 6 - Robustness checks results.

Variables	AFS (IV Probit)	NAFS (IVPoisson)
FL	0.376 (1.018)***	0.085 (0.026)***
FL^2	-0.521 (0.211)***	-1.149 (1.071)***
Control variables	Yes	Yes
Regional dummies	Yes	Yes
Instrumental variables	Yes	Yes
Wald X^2	49.62***	76.17***
Observation	572	572

Source: Survey results, 2020 *** represents statistical significance at 1% alpha levels respectively. All numbers in parentheses are robust standard errors. Reference region is Northern.

shown in table 6, the relationship between the focal variable (FL) and the outcome variables is positive and significant, but its square negative. The finding depicts that regardless of resetting the focal variable, the result in table 6 concurs with the estimates in table 4; thus, there is a non-linear relationship between the treated and the outcome variables and provides evidence that the results of this research are robust.

CONCLUSION AND POLICY IMPLICATIONS

In this paper, the author examined the relationship between FL and AFS using primary data through an empirical analysis. Again, descriptive statistics and 2SRI estimation technique was employed for the analysis. The followings are the conclusion emerging from our findings. The estimated

Table 7 - Financial literacy questions and responses.

Question	Answers
1. Suppose you had $100 in your savings account with a 2% annual interest. After 5 years, how much will you have in this account if you leave your money to gain interest? (Interest rate)	(a) more than $102 (b) exactly $102 (c) less than $102 (d)I don't know
2. Your savings account has a 1% annual interest and the annual inflation is 2%. After a year, will you be able to buy more than today using the money saved in this account? (Inflation)	(a) Yes (b)No (c)I don't know
3. Is the following statement true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund." (Risk diversification)	(a) True (b) False (c)I don't know
4. You want to borrow GH¢500 from a money lender (M1). He says that you can get it but you must pay him GH¢600 in a month. Another money lender (M2) says you have to pay GH¢600 plus 15% in a month. Which one is better? (Borrowing)	(a)M1 (b)M2 (c)I don't know
5. Assume a friend inherits GH¢10,000 today and his sibling inherits GH¢10,000 3 years from now. Who is richer because of the inheritance? (Time value of money)	(a) My friend (b) His sibling (c) They are equally rich (d)I don't know
6. Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income? (Money illusion)	(a) More than today (b) The same (c) Less than today (d)I don't know
7. A second hand farm machinery is more expensive to insure than a brand new one? (insurance)	(a) True (b) False (d)I don't know

Table 8 - IV validity test (Pearson correlation coefficient analysis).

Variables	Correlation coefficients	P-Value
AFS	0.257	0.338
NAFS	1.056	0.592
FL	0.088	0.015

results show that financial literacy is significantly and positively related to AFS and NAFS, but it square is inversely related to AFS and AFS. This indicates that there is a non-linear relationship between financial literacy and access to financial services. This result indicates that FL in developing countries like Ghana does not inevitably lead to access to financial services. In addition, other control variables such as age, gender, education level, household size, homeownership, and extension services significantly influence AFS.

Furthermore, the disaggregated analysis by gender composition revealed a non-linear relationship between FL and AFS for males and females. However, FL has a larger impact on the AFS of male household heads compared with their female counterparts. The disaggregated analysis by household income level also revealed that FL impact on AFS is profoundly related to their low-income peers.

The following are some policy implications from the study. The non-linear relationship between FL and AFS generated implies that policymakers should focus on improving individuals' financial knowledge. For example, the government can initiate the creation of a rural committee to educate rural residents on financial issues through radio broadcasting and meetings. Also, the negative relationship between the distance variable and AFS calls for essential policy measures. Thus, governments are advised to promote the levels of the financial services by implementing some interventions to enhance the business environment essential for private entities, including banks and other financial institutions, to operate and expand financial services to more reserved rural areas. The provision of banks and other financial institutions indicators increases should financial services expand they expand their resources, which also fosters the increase in demand-side indicators. The expansion of services to distant areas may encourage individuals to be financially inclusive, which may help reduce current and future risk of poverty.

The study has some limitations which need to be addressed. First, this study's sample size may not be enough to draw an accurate conclusion; therefore, future researchers can consider larger sample size. Moreover, the study only focused on rural households in four regions in Ghana. It is recommended that future researchers consider more rural households, particularly the entire nation or more regions to verify whether the conclusion of this study is applicable in their studies. Other researchers can focus on urban communities to comparative discussions and conclusions.

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DECLARATION OF CONFLICT OF INTEREST

We have no conflict of interest to declare.

AUTHORS' CONTRIBUTIONS

All authors have equal contributions.

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