Financial Literacy and the Use of Mobile Financial Services

Abstract:

This paper aims to explore the influence that consumers' financial literacy exerts on their engagement with mobile financial services.Utilizing the dataset from 2021 National Financial Capability Study (NFCS), this paper employs a composite metric for financial literacy, encompassing both an objective test score and a subjective self-assessment of financial literacy.Meanwhile, this paper delves into the utilization of mobile financial services across three key dimensions: mobile banking, mobile payments, and mobile transfers.Given that the dependent variable is an ordered discrete variable, this study employs ordered probit regression to enhance the precision of the estimation.The results indicate that the impact of objective financial services varies significantly across different types of mobile financial services. It boosts the utilization of mobile banking services, while simultaneously reducing the frequency of mobile payments and transfers.The results also show that subjective financial literacy always positively relate to the use of mobile financial services. Further, this paper investigates how financial literacy miscalibration affects the use of mobile financial services. The results show that individuals who over-evaluated their financial literacy are more likely to use mobile financial services than individuals who under-evaluated or correct-evaluated their financial literacy.The results serve as decisive evidence for policymakers to enhance consumer financial literacy, thereby improving their use of mobile financial services.

Keyword:financial literacy; mobile financial services; consumer financial behavior; ordered probit regression

1. Introduction

As mobile devices become ubiquitous and internet development advances, more and more financial institutions and enterprises began to provide mobile financial services (MFS) in order to optimize the users' experience and reduce costs (Chawla & Joshi, 2017). In addition, MFS are also regarded as a tool to achieve financial inclusion, particularly for countries with lower incomes, a less developed financial sector, and fewer bank branches(Grohmann et al., 2018).

However, the adoption and use of MFS have failed to meet the expected target (Chaouali et al., 2019; Foroughi et al., 2019; Thakur, 2018; Thanh Khoa, 2020).A

notable discrepancy exists betweenthe rapid pace of technological progressand the rate of mobile banking penetration (Archana & Kansal, 2012). Chung and Liang (2020) also described the situation of mobile payments' adoption in Taiwan, "Only a quarter of consumers have any experience with mobile payments, while most of them used to adopt traditional banking services."Many scholars attribute this problem to consumers' own factors which influence their intention to use MFS.Self-determination, which motivates individual behavior, has been found to be antecedent to resistance to innovation and further influences people's intention to use mobile payments(Chung & Liang, 2020). Laforet and Li (2005)took culture into consideration. Their study suggests that the main barriers to the usage of online banking are derived from Chinese traditional cash-carry banking culture. Anyway, enhancing the use of MFS and helping consumers overcome the barriers during the use of MFS need to be urgently solved.

We propose that financial literacy is the key to dealing with the problem. Financial literacy is defined as the capacity to make well-informed assessments and make efficient decisions concerning the distribution and management of financial resources(Noctor et al., 1992). The definition implies that there is a potential and beneficial relationship between financial literacy and an individual's financial behavior and choice-making processes.In fact, many researchers have proven it by conducting empirical tests. Current studies indicate that consumers superior financial literacy are more likely to open and maintain their own accounts, and they excel at independently managing their financial affairs(Nejad & Javid, 2018). Shahrabani (2012)suggested that financially literate people have a greater intention to control their budget without incurring debt. Wann (2016)emphasized the significance of imparting financial literacy to college students, arguing that financial literacy course can motivate students cultivate sound financial habits, includingregular saving and budgeting, engage in investment at earlier stage, andavoid the pitfalls of credit cards.Therefore, we regard using MFS as a beneficial financial behavior, and we expect higher literacy will lead to frequent use of MFS.

This study enriches the MFSliterature by incorporating the 'financial literacy' construct as a key variable to elucidate consumer behavior.Improving the use of MFS requires further analysis and would be of benefit to all stakeholders in the financial services sector and policymakers to achieve financial inclusion. Meanwhile, most studies focused on mobile banking and ignored the other types of MFS. To address this research gap, this study introduces three types of MFS in total, including mobile

banking, mobile payments, and mobile transfers. Mobile banking enables customers to perform a range of banking tasks remotely using their mobile devices, such as account balance checks, transfers and investments. It makes banking more convenient and accessible(Shaikh & Karjaluoto, 2015). Mobile payments have been defined as "the payments for goods, services, and bills with a mobile device by taking advantage of wireless and other communication technologies" (Dahlberg et al., 2015). Unlike mobile banking, which primarily focuses on the process of transferring funds through the bank's app, mobile transfers take more channels into consideration, such as SMS services and third-party payment platforms. This study shows the differences between categories, serving as a basis for financial institution managers and policymakers to increase the use of MFS. Moreover, differing from the previous literature, this study sets consumers' actual usage frequency as the dependent variable rather than the intention of adopting MFS, which makes the results more objective.

The paper is arranged as follows: in section 2, the paper will provide a comprehensive review of the previous researchon MFS and financial literacy. Section 3 infers the hypothesis in this study based on previous literature conclusions. Section 4 illustrates the collected data and discusses the research setting and model. Section 6 investigates the theoretical and practical significance of the study, along with future research avenues, based on the analysis results presented in Section 5.

2. Previous research

2.1 Previous Research on MFS

Most MFS research focuses on the factors that influence customer usage intentions and adoption. As early as 2007, Mallat proposed that the adoption of mobile payments is determined by specific contextual elements, such as the lack of other payment options and immediate need.Also, Mallat highlighted that the acceptance of mobile payments faces obstacles, especially the exorbitant costs, the complicated procedures, and the potential risks.Subsequently, scholars began to employ consumer behavior models in their research. The most widely used is Technology Acceptance Model (TAM), which established by Davis (1989). According to the TAM, the perceived usefulness and ease of use are the key drivers for people to accept technology and further influence their actual behavior. In the scenario of using mobile financial services, scholars further extended TAM by introducing the related factors. For instance, Alsamydai (2014) extendsthe TAM under the context of using mobile banking services by introducing the factors of quality and experience. Sun et al. (2010)corporates perceived credibility and perceived costinto the original modelto

analyze the usage of mobile service. Besides that, scholars also use the other well-established models, such asthe “Theory of Planned Behavior (TPB)” (Ajzen, 1991), “Unified Theory of Acceptance and Use of Technology (UTAUT)” (Venkatesh et al., 2003; Venkatesh et al., 2012), and“Diffusion of Innovation (DOI)” (Rogers et al., 2019) to explore MFS adoption.

Recently, there is a burgeoning curiosity in examining the determinants that shape consumer adoption of Mobile Financial Services (MFS) from personal-related factors.Some scholars set a series of constructs that capture consumers' inclusion and sensitivity when facing new and changeablethings.Current studies have found that factors likepersonal habit(Yen & Wu, 2016),willingness and trust to new technologies(Pham & Ho, 2015), a tendency towards optimism (Humbani & Wiese, 2019) are positively correlated to the adoption of MFS. Meanwhile, other researchers focus on variables related to an individual's innovative capacity and technical skills, which can enhance their confidence and ability to use MFS, such as digital literacy(Ullah et al., 2022), mobile phone skills’ possession(Thakur, 2018), financial capability(Fisher & Yeo, 2017). Meanwhile, a few studies investigate the determinants of continuance intention (CI) to use MFS, which focus on the consumers’ behavior at the post-consumption phase(Naruetharadhol et al., 2021; Susanto et al., 2016).In existing literature, Expectation Confirmation Model (ECM), which proposed by Oliver in 1980,is the foundation of a post-consumption model used to explain continuous intention of MFS (Nguyen & Dao, 2024; Park et al., 2017; Susanto et al., 2016). According to ECM, confirmation from the use of technology influences perceived usefulness (PU) and satisfaction, which were strong determinants of CI. Confirmation refers to the agreement between actual and expected performance of products or services. If the product or service performs better than expected, this is known as positive confirmation, and it typically leads to consumer satisfaction and trust level When consumers are satisfied, they are more likely to consider buying the product or service again in the future. Based on ECM, some studies also extended model by introducing other constructs, such as trust, perceived privacy and security, self-efficiency (Susanto et al., 2016) and inertia(Park et al., 2017).

2.2Previous Research on Financial Literacy

Financial literacy refers to the capacity to make well-informed assessments and make efficient choices regarding the utilization and administration of financial resources(Noctor et al., 1992).This capability is mainly demonstrated in managing or avoiding debt, creating and adhering to budgets, saving for the future, balancing bank

accounts, and effectively utilizing financial products and services (CBF, 2004(a); RMR, 2003(a)).To possess such skills, an individual must have a solid grasp of how money works and its role in the economy. This understanding is crucial for navigating the complexities of personal finance and achieving financial well-being (Lusardi & Mitchell, 2006; Starcek & Trunk, 2013).

Based on the criteria of objectivity and subjectivity, financial literacy can be further divided into objective financial literacy (OFL) and subjective financial literacy (SFL).The former describes the actual knowledge or skills consumers have, which often measured by the correct ratio of respondents' answers in a financial literacy test.The existing measurement approaches are varied, with different emphases. For example,Lusardi and Mitchell (2013)focused on testing respondents' financial foundation with a questionnaire including three basic questions about interest,inflation and risk diversification. This allows the researcher to assess individuals' financial literacy quickly and effectively.Delavande et al. (2008)utilized a more comprehensive financial literacy scale that encompassedfinancial concepts such as portfolio diversification, underlying principles of annuities, and so on. Respondents are asked to rate the accuracy of statements on a 12-point scale. Based on these ratings, the final scores are calculated. This method provided a more holistic assessment of the participants' grasp of financial knowledge and quantified the levels of financial literacy among different respondents.Hung et al. (2009) emphasized to test individuals' ability to apply their financial decisions in real-world investment scenarios. They conducted a portfolio allocation experiment with participants in their study, observing their choices to determine whether they chose strategies that minimized investment costs. This approach offers a more direct assessment of the respondents' understanding and application abilities in financial decision-making. It not only examines the financial knowledge of the participants but also tests their behavioral choices in an actual investment setting.

Researchers often rely on subjective indicators in empirical studies of economic phenomena that are difficult to quantify with objective data(Krueger, 2006). The advantage of subjective measurement reflects in capturing invisible elements beyond the reach of objective measuring, which is especially valuable in areas of study involving broadly defined concepts(Jahedi & Méndez, 2014).There is currently no consensus in the academic community on the definition of financial literacy, hence the measurement methods are not standardized(Allgood & Walstad, 2015). Therefore, scholars begin to use some type of subjective measure. In general, SFL are derived

from survey questions such as “What is your knowledge of financial markets?” or “How do you estimate your level of knowledge and experience about risks and potential obligations inherent to shares, bonds, funds and structured products?”, which ask respondents to assess their financial knowledge or skills. Sometimes, the respondents also might be asked to rate their agreement with statements in the questionnaire, such as "I think I can manage my finances effectively” or “I have a good understanding of investing”. In addition, the confidence scale is also commonly used. It mainly asks respondents to rate their level of confidence in handling various financial tasks.

Recently, there has been a growing interest in using subjective measures in related research. The reason is mainly because many scholars realize that using objective methods alone to measure financial literacy is very one-sided, and SFL focuses more on how individuals perceive their own financial knowledge and ability to handle financial affairs. Especially for studies of the relationship between financial literacy and consumer behavior or decision-making (involving the participation of personal subjective consciousness), the distinction between these two types of financial literacy is even more important. Many current studies in this field show the two types of financial literacy are totally distinct constructs. This part of the literature will be introduced in detail in Chapter 2.3.

2.3 The Impact of Financial Literacy on Financial Behavior

The majority of studies have concluded that financial literacy exerts a significant positive influence on individuals' financial behavior and decision-making.For instance, Wann (2016)investigated the impact of financial literacy course on changing students’ behaviorand found that teaching financial literacy to college students can improve their financial behavior. According to the study, those students began to create budgets proactively and choose financial productsthat align with their needs, including savings and investments.Lusardi and Mitchell (2006)investigated Americans over the age of 50 on their retirement savings plans. The study showed that their financial literacy and planning are clearly interrelated, and financial literate individuals tend to keep track of spending and budgeting so that they can accumulate high wealth when they enter retirement.Recent research has also proved financial literacy confers benefits on individuals’financial activities, such as taking less risky credit(Liu & Zhang, 2021), managing wealth earlier(Fong et al., 2021).However, some researchers proposed opposing viewpoints. Mutlu and Özer (2021)found that individuals with an internal locus of control exhibits a deterioration in financial behavior when financial literacy is

taken into account. Also, some researchers have not identified that there are any relationships between them. Fernandes et al. (2014) conducted meta-analysis which revealing that financial education interventions explained only about 0.1% of the variance in the financial behaviors.

As previously mentioned, OFL and SFL capture different aspects. Therefore, it can be inferred that they also affect financial behavior in different ways. Many scholars have realized that and conducted further research on the difference between OFL and SFL. Liu and Zhang (2021)proposed that the impact of SFL on risky credit behavior was greater than that of OFL.Henager and Cude (2016)found the impacts of SFL and OFL are differential across various age groups anddifferent time horizons. In the study conducted by Kim et al. (2019), OFL shows substantial negative effect on delinquency, while SFL don't.Apart from that, some literature has paid attention to the discrepancy between OFL and SFL in influencing financial behavior. To some extent, it is often used to represent whether a person is overconfident in their financial knowledge(Kim et al., 2019; Robb et al., 2015). Specifically, a person who scores himself on a higher financial literacy level must believe he(she) has better knowledge or skills in financial behavior. If a person with high SFL and low OFL is thought of as overconfident, and vice versa, he(she) is considered to be underconfident. In general, over-confidence in one's financial literacy has been linked to speculative financial actions, such as high-level risky investment(Pikulina et al., 2017), the unwillingness to seeking investment advice(Lewis, 2018), mortgage delinquency(Kim et al., 2019).Conversely, some suggest that confidence in one's financial literacy might improve financial decisions or outcomes, as taking necessary action may depend on having such confidence(Allgood & Walstad, 2015; Hung et al., 2009).

In summary, the existing literature has provided preliminary research on financial literacy and MFS, but it has several notable limitations, primarily reflected in the following aspects:

(1) Most of the research on MFS focuses on the factors influencing consumers' usage intentions and adoption, but few studies focus on consumers' actual use of MFS.However, only when the real condition of use is set as the dependent variable do the influencing elements become more meaningful for improving the use of MFS.

(2) There is currently very little literature linking financial literacy and the use of MFS. But in fact, the existing research has largely demonstrated that financial literacy is the keyfactors affecting of personal financial behavior. This implies that financial literacy is closely connected to an individual's comprehension and proficiency in

financial concepts, and it is also intrinsically linked to the application of this knowledge in the process of making financial decisions and executing financial actions. In essence, it suggests that being financially literate enables individuals to navigate financial matters more effectively and make informed choices that can impact their economic well-being.Therefore, it is necessary to incorporate financial literacy into the research framework that affects MFS use.

(3) There is a lack of multi-dimensional indicator construction. Most research on MFS focuses on mobile banking, but in fact, the concept of MFS includes more dimensions, for example, mobile payments and mobile transfers.

3. Research model and hypothesis

3.1 Financial Literacy and the Use of MFS

Individual financial literacy differences are primarily reflected in their cognitive and skills, which ultimately lead to differences in their decision-making and behavior. OFL is about the actual understanding and capabilities of a consumer in financial matters, while SFL is about the consumer's beliefs and perceptions of their own financial literacy. Both are important, but they provide different insights into a person's financial acumen. OFL provides an objective measure, whereas SFL offers a subjective perspective on financial self-efficacy(Hadar et al., 2013).

Usually, individuals need to use MFS for cash transfers, investments, wealth management, deposits, and loans on their own. This differs from traditional offline financial institutions, where service workers provide face-to-face consultation and help. Although some online services provide online assistance via chatbots, they may not address all difficulties. In particular, establishing trust can be difficult for individuals due to the absence of humanized communication. In addition, what was once typically handled by financial institution service personnel—such as customer risk assessment—is now increasingly requiring users to have a deep understanding of their own risk preferences and various financial products. Only with this knowledge can they choose the best portfolio for themselves. In this context, individuals with enough financial literacy will exhibit stronger adaptability, which means that they can quickly master the use of MFS and make full use of their functions to improve their daily lives and work(Nejad & Javid, 2018). Consequently, their perceived ease of use, perceived usefulness, and satisfaction are also expected to increase. Meanwhile, financial-literate people are more likely to realize “confirmation” in their post-adoption, which benefits from their better understanding of fintech. Confirmation is

derived from the expectation-confirmation model (ECT) and refers to the agreement between the IT product's actual and expected performance.

However, mobile financial services are intelligent and convenient services that rely on big data, cloud computing, artificial intelligence, and other technologies through virtual remote channels such as network platforms and mobile apps. It facilitates users' lives but also comes with emerging risks such as cyber security risks, fraud risks, and privacy breaches(Hernández-Ortega, 2011; Zhou, 2012). Therefore, risk awareness is also important factor affecting the use of MFS. For high-OFL users, they are more risk-sensitive, and their financial behavior is more prudent, which can infer that they are more likely to stop using MFS once they perceive the risk threat of mobile finance services. In addition,

Conversely, scholars have found that self-perceived financial literacy can significantly influence an individual's attitude towards risk, potentially leading to more adventurous financial behaviors(Croy et al., 2010; Nguyen et al., 2017; Nguyen, 2016). In the context of using mobile financial services, high-SFL users may be more likely to try and use MFS due to their high-risk tolerance. In addition, consumers who show a high level of SFL are more confident in their ability to make financial decisions, which may lead to them being less affected by others and more open to technological innovation.

Based on the above analysis, we infer that the relationship between financial literacy and the use of MFS is as follows:

H1a. The higher the OFL of individuals, the higher the frequency of their use of MFS.

H1b. The higher the OFL of individuals, the lower the frequency of their use of MFS.

H2. The higher the SFL of individuals, the higher the frequency of their use of MFS.

3.2 Financial Literacy Miscalibration and the Use of MFS

Financial literacy miscalibration refers to the discrepancy between an individual's self-assessment of their financial knowledge or capabilities and their actual proficiency. Overconfident individuals, who often overestimate their abilities, are more inclined to embrace higher levels of risk. This propensity for risk-taking can lead to a greater acceptance and utilization of innovative financial technologies, such as MFS. Moreover, mobile financial services offer a broader array of investment channels and products, which can be particularly appealing to overconfident investors

with a higher appetite for risk assets. These investors are drawn to the novelty and potential rewards associated with a wider range of financial options. In addition, overconfident investors typically engage in frequent trading activities. MFS provide an easily accessible and convenient means for making investment decisions and executing trades. As a result, individuals who are overconfident may particularly appreciate and benefit from the convenience offered by MFS. However, overconfident individuals often experience losses due to extreme behavior and tend to attribute failure to external factors rather than their own decisions. In this scenario, users with excessive confidence may mistakenly perceive MFS as the cause of failure, leading them to discontinue their use of mobile finance services.

In contrast, people who lack self-confidence are constrained by their own mistrust and face many obstacles in accepting financial innovation.For example, they may be more risk-averse and hesitant to adopt new financial products and services. They may also be concerned about new technology, fearing their inability to understand and master the operations of MFS. Furthermore, they may be overly worried about the security of MFS, such as personal information leaks or financial theft. As a result, such individuals exhibit extraordinary prudence when using MFS.

Based on the above analysis, we infer that the relationship between financial literacymiscalibration and the use of MFS is as follows:

H3a. Overconfidence is positively related to the frequency of individuals using MFS.

H3b. Overconfidence is negatively related to the frequency of individuals using MFS.

H4. Lack of confidenceis negatively related to the frequency of individuals using MFS.

4. Methodology

4.1 Data

The dataset is derived from State-by-State Survey of National Financial Capability Study (NFCS). The survey founded by the FIRNA and has been conducted every three years since 2009.The survey is designed with a focus on assessing participants' financial capacity, literacy, and habits, while also providing a deeper analysis of the demographic, behavioral, and attitudinal factors that are foundational to these financial aspects. Utilizing data from the 2021 NFCS, our study is grounded in a sample that is reflective of the nation, encompassing 27,118 U.S. adults. This

sampling strategy ensures a representation of approximately 500 individuals per state, extending to the District of Columbia as well. Post-exclusion of cases with absent data for certain variables, the refined dataset comprises 26,482 complete observations, forming the basis for our analytical insights.

4.1 Model Specification and Variables

This research primarily explores the effect of various factors on the use of MFS ($mobile_{fin_{h,i}}$), where$i$indexes individuals and h indexes the categories of MFS. It indicates the frequency of the consumer use particular mobile financial service. The model is specified as follows:

$$mobile_{fin_{h,i}} = \alpha_0 + \sum_{j=1}^{N} \beta_j * fin_{lit_{j,i}} + \sum_{k=1}^{M} \beta_k * cv_{k,i} + \gamma_s + \varepsilon_i \quad (1)$$

Here, $fin_{lit_{j,i}}$is the independent variable in this study. Itrepresents the financial literacyfor the i-th individual, where$j$ indexes the different measurements of financial literacy and N is the total number of measurements. For instance, financial literacy-related variables incorporate OFL (there are 6 questions that test respondent's financial knowledge, including compound interest, inflation, bond prices, compound interest doubling, repayment interest, risk diversification) and SFL (people's subjective assessment of their financial literacy). In addition, whether the consumer can assess their financial literacy correctly (the gap between OFL scoring and subjective scoring) is introduced as well. The coefficients βj capture the effect of financial literacyon the use of MFS, representing the pivotal parameters in this study.

Meanwhile, there are also other factors taking into accounts in this study. All of them are put into the control variables, represents as cv_k. In this study, control variables include age, gender(two categories: Female vs. Male), education(three categories: High school or lower, Bachelor, Master or higher), marital status (two categories: Married and Not Married), math capability(1—Pretty good at math, 7—Not good at math), ethnicity(two categories: White and Black), the number of child(four categories: 1, 2, 3, 4 or more), risk attitude(1—Completely unwilling to take risk, 10—Extremely willing to take risk), own credit assessment(1—Extremelypoor, 5—Excellent), income(1—less than $15,000, 10—$300,000 or more), work state(three categories: Not working, Self-employed, Working), whether taking part in financial markets, wealth management behavior(there are a total of 6 questions that test respondent's ability of wealth management, including income and

expenditure status, debt repayment status, income stability, and savings status).

Besides that, γ_s represents state-specific fixed effects, and $\varepsilon_i$is the error term.

Table1. Variable specification

Variable label	Attribute
Use of mobile bank	"How often do you access your checking or savings account by using mobile bank"1—Never, 2—Sometimes, 3—Frequently
Use of mobile payments	"How often do you use your mobile phone to pay for a product or service in person"1—Never, 2—Sometimes, 3—Frequently
Use of mobile transfers	"How often do you use your mobile phone to transfer money to another person?" 1—Never, 2—Sometimes, 3—Frequently
Financial knowledge score	Correct answers are worth 1 point, and wrong answers are not scored.0—All answers are wrong, 6—Answered all questions correctly
Subjective assessment of financial literacy	"How would you assess your overall financial knowledge?"1—Very low, 7—Very high
Over confidence	"Financial knowledge score is less than or equal to the average, but subjective assessment is greater than or equal to the average?" 1—Yes, 0—No
Lack of confidence	"Financial knowledge score is above average, but subjective assessment is below average?" 1—Yes, 0—No
Correct understanding	"Financial knowledge scores and subjective assessments are both greater or less than average?" 1—Yes, 0—No
Age	Age 18 to 24: Age_1 = 1, Age 25 to 34: Age_2 = 1, Age 35 to 44: Age_3 = 1, Age 45 to 54: Age_4 = 1, Age 55 to 64: Age_5 = 1, Age 65 or older: Age_6 = 1
Gender	1 = M ale, 0 = Female
High school or lower	1 = Yes, 0 = No
Bachelor	1 = Yes, 0 = No
Master or higher	1 = Yes, 0 = No
Being married	1 = married, 0 = not married
Math capability	"I am pretty good at math" 1—Total Disagreement e, 7—Total Agreement
Ethnicity	White: ethn = 1, Black: ethn1 = 0
The number of children	1 = One child, 2 = Two children, 3 = Three children, 4 = Four or more children
Risk attitude	"When thinking of your financial investments, how willing are you to take risks?"1—Completely unwilling, 10—Extremely willing
Own credit assessment	"How would you rate your current credit record?"1—Extremely Poor 5—Excellent
Annual Income	1 = Less than $15000, 2 = $15000 to $25000, 3 = $25000 to $50000, 4 = $50000 to $75000, 5 = $75000 to $100000, 6 = $100000 to $150000, 7 = $150000 to $200000, 8 = $200000 to $300000
Working state	1 = Not working, 2 = Self-employed, 3 = Working
whether taking part in financial markets	"Not including retirement accounts, do you have any investments in stocks, bonds, mutual funds, or other securities?"1—Yes, 2—No
wealth management behavior	The option that shows strong management ability is worth 1 point, otherwise it is worth 0 points. 0—Not good at managing wealth, 6—Very good at managing wealth).

4.2 Estimation Method

Based on the survey data, the dependent variable ($mobile_{fin}$) is acategorical variable with a specified order (1—Never, 2—Sometimes, 3—Frequently). In such cases, the traditional OLS method will have problems with its robustness and accuracy in parameter estimation. Therefore, we employ the Ordinary Least Squares (OLS) regression method and subsequently apply the ordered probit regression to enhance the accuracy of our estimation results. Let $mobile\_fin^* = X'\beta + \varepsilon_i$.$mobile\_fin^*$ is the underlying latent variable that indexes the usage frequency of particular MFS, $X_i' \in (fin_{lit}, cv)$ and ε_i is the residual term which is assumed to be normally distributed. Meanwhile, assume that the use of MFS ($mobile\_fin^*$) follow the following rules,

$$mobile\_fin_i = \begin{cases} 1, & if\ \ mobile\_fin_i^* \le \delta_1 \\ 2, & if\ \ \delta_1 \le mobile\_fin_i^* \le \delta_2 \\ 3, & if\ \ mobile\_fin_i^* > \delta_2 \end{cases} \quad (2)$$

In Eq. (2), δ_1 and δ_2 are unobservable thresholds, which define the ranges of the latent variable $mobile\_fin^*$. In other words, given the ordered usage frequency of the particular mobile financial service, the respondents are forced to choose the category of $mobile\_fin_i$ that most closely represents their own situation for MFS using, $mobile\_fin_i^*$. According to Equation(2), we believe that the set of financial literacy variables and control variables in vector X can explain the MFS using frequency of respondents. Under the assumption of normality, the probabilities of the observed using frequencyof MFSfollow the following rules:

$$\begin{aligned} Pr(mobile\_fin_i = 1|X) &= \Pr(mobile\_fin_i^* \le \delta_1|X) \\ &= \Pr(\beta X_i' + \varepsilon_i \le \delta_1|X) \\ &= \Pr(\varepsilon_i \le \delta_1 - X_i'\beta) = \Phi(\delta_1 - X_i'\beta) \end{aligned} \quad (3)$$

$$\begin{aligned} Pr(mobile\_fin_i = 2|X) &= \Pr(\delta_1 \le mobile\_fin_i^* \le \delta_2|X) \\ &= \Pr(\delta_1 \le \beta X_i' + \varepsilon_i \le \delta_2|X) \\ &= \Pr(\varepsilon_i \le \delta_2 - X_i'\beta) - Pr(\varepsilon_i \le \delta_1 - X_i'\beta) \\ &= \Phi(\delta_2 - X_i'\beta) - \Phi(\delta_1 - X_i'\beta) \end{aligned} \quad (4)$$

$$\begin{aligned} Pr(mobile\_fin_i = 3|X) &= \Pr(mobile\_fin_i^* > \delta_2|X) \\ &= \Pr(\beta X_i' + \varepsilon_i > \delta_2|X) \\ &= 1 - \Pr(\varepsilon_i \delta_2 - X_i'\beta) \\ &= 1 - \Phi(\delta_2 - X_i'\beta) \end{aligned} \quad (5)$$

where Φ is a normal distribution cumulative function. The structure of Eq. (3) - Eq. (5) provide the framework for our research. Estimation of parameters β, δ_1 and δ_2 is based on maximum likelihood estimation.

4.3 Statistical Description

The uses of each MFS type are displayed in Figure 1. Regarding mobile banking,

only 24.3% of respondents haven't used it, and among the users of mobile banking, about two-thirds of users use mobile banking frequently. For mobile payments, about 41.4% of the respondents use mobile payments sometimes or frequently, and above 50% of the respondents have never used mobile payments. Besides that, about 46.37% of respondents never use mobile transfers, while among the users of mobile transfers, above two-thirds of users use mobile payments sometimes. In comparison, mobile banking has the highest penetration rate, followed by mobile transfers, but most users do not use it frequently, while mobile payment has the lowest penetration rate.

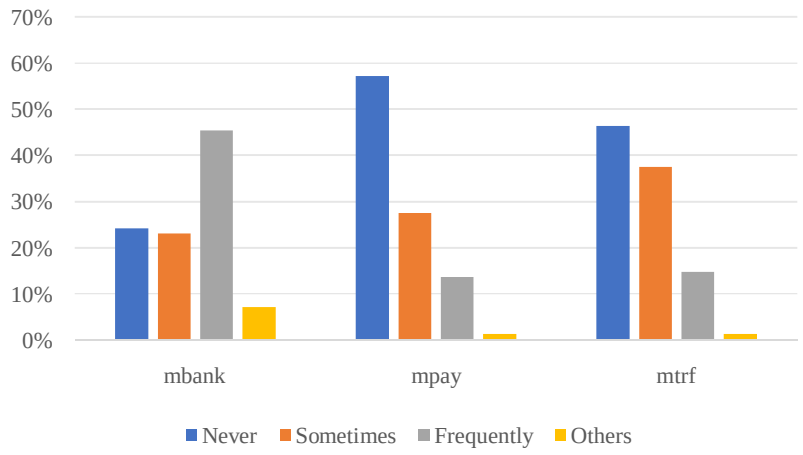

Figure 1. The use of the three MFS in daily life by three frequency categories [1] in U.S., in %(n = 26482). Source: Summary responses from the 2021 NFCS.

Table 2 provides a comprehensive overview of the descriptive statistics for our dataset. For the dependent variable, the mean scores for the use of mobile banking, mobile payments, and mobile transfers are 2.067 out of 3, 1.538 out of 3, and 1.659 out of 3, respectively, indicating a considerably high frequency of MFS usage. The average value of OFLin our sampling is 3 out of 6, suggesting that the sampled respondents had a moderate level of OFL. In addition, the mean value of SFL in our sampling is 4.99 out of 7, suggesting that a large portion of respondents rate their own financial literacy skills at a moderate level..

Table2. Descriptive Statistics.

Variable label	Variable	Obs	Mean	Std. Dev.	Min	Max
Use of mobile banking	mbank	26,482	2.067	0.991	0	3
Use of mobile payments	mpay	26,482	1.538	0.742	0	3
Use of mobile transfers	mtrf	26,482	1.659	0.739	0	3
Objective financial literacy	OFL	26,482	3.004	1.697	0	6

[1]Others means don't know or prefer not to say.

Subjective financial literacy	SFL	26,482	4.986	1.491	0	7
Over confidence	ovflit	26,482	0.367	0.482	0	1
Lack of confidence	unflit	26,482	0.07	0.255	0	1
Correct understanding	deflit	26,482	0.563	0.496	0	1
Gender	gender	26,482	0.461	0.499	0	1
Age 18 to 24	age_1	26,482	0.107	0.309	0	1
Age 25 to 34	age_2	26,482	0.173	0.378	0	1
Age 35 to 44	age_3	26,482	0.169	0.374	0	1
Age 45 to 54	age_4	26,482	0.171	0.376	0	1
Age 55 to 64	age_5	26,482	0.176	0.381	0	1
Age 65 or older	age_6	26,482	0.205	0.404	0	1
High school or lower	edu1	26,482	0.270	0.444	0	1
Master or higher	edu2	26,482	0.619	0.486	0	1
Undergraduate	edu3	26,482	0.111	0.314	0	1
Being married	married	26,482	0.494	0.500	0	1
Math capability	mathcap	26,482	5.379	1.717	0	7
Ethnicity	ethn	26,482	0.742	0.438	0	1
The number of children	child	26,482	0.646	1.045	0	4
Risk attitude	riskatt	26,482	4.961	2.773	0	10
Own credit assessment	asscrdt	26,482	3.706	1.462	0	5
Annual Income	income	26,482	4.506	2.200	1	10
Working state	worksta	26,482	2.029	0.959	1	3
Whether taking part in financial markets	finpart	26,482	0.362	0.481	0	1
Wealth management behavior	desfb	26,482	3.201	1.408	0	6

Source: The results of descriptive statistics are from the 2021 National Financial Capability Study

5. Empirical Results

5.1 Results of Correlation Analysis

Table 4 presents the correlation matrix, illustrating the relationship between the variables.In general, the correlations between financial literacy and the use of MFS are as expected. The results reveal a significant positive association between OFL and the use of mobile banking, with coefficient 0.014 ($p<0.05$). The use of both mobile payments and mobile transfers are negatively related to the OFL, with coefficients 0.123 and -0.115 respectively, at a significance level of 1%. Furthermore, in terms of SFL, the correlation matrix shows that it is significantly positive for the use of mobile banking, mobile payments, and mobile transfers, while the correlated coefficients are 0.06, 0.074, and 0.024respectively, at a significance level of 1%.

Furthermore, the control variables exhibit significant correlations with MFS usage. For instance, individual's risk attitude, employment status, and participation in financial markets are each positively related to MFS usage, with correlation coefficients all indicating statistical significance at the $p<0.001$ level.In contrast, the

variable of own credit assessment shows a significant negative relationship with the use of mobile banking, mobile payments, and mobile transfers, with respective coefficients of -0.017, -0.071, and -0.132, each significant at the 1% confidence level. Besides that, some control variables demonstrate different correlation in the different type of MFS, such as math capability and wealth management behavior.

Table 3. Correlations between variables

Variables	Use of mobile banking	Use of mobile payments	Use of mobile transfers	OFL	SFL	Math capability	Risk attitude	Own credit assessment	Annual Income	Working state	Whether taking part in financial markets	Wealth managem-ent behavior
Use of mobile banking	1.000											
Use of mobile payments	0.286***	1.000										
Use of mobile transfers	0.431***	0.460***	1.000									
OFL	0.014**	-0.123***	-0.115***	1.000								
SFL	0.060***	0.074***	0.024***	0.286***	1.000							
Math capability	0.028***	-0.010**	-0.019***	0.335***	0.428***	1.000						
Risk attitude	0.148***	0.256***	0.241***	0.138***	0.290***	0.155***	1.000					
Own credit assessment	-0.017***	-0.071***	-0.132***	0.326***	0.336***	0.224***	0.146***	1.000				
Annual Income	0.097***	0.033***	0.033***	0.343***	0.281***	0.221***	0.253***	0.431***	1.000			
Working state	0.215***	0.191***	0.237***	0.023***	0.070***	0.042***	0.251***	0.075***	0.282***	1.000		
Whether taking part in financial	0.080***	0.064***	0.060***	0.315***	0.255***	0.166***	0.325***	0.299***	0.351***	0.096***	1.000	

markets												
Wealth management behavior	0.026***	0.010***	-0.050***	0.315***	0.340***	0.237***	0.236***	0.494***	0.494***	0.209***	0.350***	1.000

Standard errors in parentheses
*p< 0.10, **p< 0.05, ***p< 0.01

5.2 Financial literacy and The Use of MFS

Table 4 displays the regression analysis outcomes, detailing how financial literacy influences the use of three distinct types of MFS. Columns (1) and (5)exclusively include the control variables in the analysis. More specifically, Column (1) displays the OLS regression results, and Column (5) shows the ordered probit regression results. Then, OFL and SFL are incorporated into the regression model. Wherein, the OLS regression results are displayed in Columns (2), (3), and (4). Columns (6), (7), and (8) represent the ordered regression results as a result. To eliminate the impacts of state heterogeneity on estimation results, state dummy variables are incorporated into each estimation. Furthermore, to enhance the precision and reliability of the regression findings, the reported standard errors within parentheses are adjusted for robustness.

The majority of the control variables exhibit statistical significance.According to the results, compared to female consumers, male consumers use mobile banking less frequently. Regarding age, the results show that both youth aged between 18 and 34 years and adults aged between 35 and 64 years are significantly more likely to use MFS compared to elders aged more than 65 years. Compared to those with secondary education, those who had a tertiary education (undergraduate, master, or higher) were significantly more likely to use MFS. Compared to individuals who are not married, married people are more likely to use mobile banking, while this difference is not significant in the use of the other two types of MFS (mobile payments and mobile transfers). With respect to consumers' mathematical capability, the results show that those with more mathematical capability are significantly more likely to use banking, whereas its effect is not significant in the use of mobile payments and transfers. The effect of race is mainly demonstrated in the use of payments and transfers. Whites and non-Hispanics use them less compared to blacks. Besides that, risk attitude, annual income, and work stability are also significant positive relate to the use of MFS.

Columns (2) and (6) introduce financial literacy-related variables into the model, while the dependent variable remains the use of mobile banking. The results show that both objective and SFL are significantly positive for mobile bank usage frequency, since the coefficients are positive. More specifically, consumers who have more financial knowledge are more likely to use mobile banking. Also, consumers who believe they have adequate financial literacy use mobile banking more frequently.Columns (3) and (7) substituted the previous dependent variable, mobile banking, with the utilization of mobile payments. In contrast to mobile banking, consumer objective and SFL have opposing influences on the utilization of mobile

payments, with the former being negative and the latter positive. In other words, consumers with greater financial literacy are less likely to utilize mobile payment services. However, consumers who believe they have adequate financial literacy use mobile payments more frequently.Columns (4) and (8) substituted the previous dependent variable, mobile banking, with the utilization of mobile transfers. It comes to similar results as mobile payments. The consumer's OFL is negatively associated with mobile transfers usage. However, the SFL is significantly positive to mobile transfers usage frequency.

Table4. Results of regressions of financial literacy on the use of MFS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	**Mobile banking**	**Mobile banking**	**Mobile payments**	**Mobile transfer**	**Mobile banking**	**Mobile banking**	**Mobile payments**	**Mobile transfer**
OFL		0.025***	-0.041***	-0.012***		0.034***	-0.059***	-0.016***
		(0.004)	(0.003)	(0.003)		(0.005)	(0.006)	(0.006)
SFL		0.038***	0.044***	0.030***		0.045***	0.073***	0.052***
		(0.006)	(0.004)	(0.004)		(0.007)	(0.007)	(0.007)
Male	-0.080***	-0.093***	0.041***	-0.062***	-0.102***	-0.119***	0.060***	-0.115***
	(0.015)	(0.016)	(0.010)	(0.011)	(0.019)	(0.020)	(0.018)	(0.019)
Age 18 to 24	0.609***	0.646***	0.445***	0.714***	0.653***	0.701***	0.780***	1.248***
	(0.031)	(0.031)	(0.024)	(0.022)	(0.041)	(0.041)	(0.042)	(0.046)
Age 25 to 34	0.702***	0.735***	0.417***	0.680***	0.786***	0.830***	0.744***	1.209***
	(0.027)	(0.026)	(0.021)	(0.019)	(0.036)	(0.035)	(0.035)	(0.036)
Age 35 to 44	0.615***	0.646***	0.309***	0.523***	0.669***	0.709***	0.572***	0.958***
	(0.024)	(0.025)	(0.018)	(0.017)	(0.030)	(0.030)	(0.030)	(0.033)
Age 45 to 54	0.505***	0.525***	0.197***	0.343***	0.532***	0.557***	0.400***	0.672***
	(0.022)	(0.022)	(0.015)	(0.012)	(0.027)	(0.026)	(0.027)	(0.024)
Age 55 to 64	0.241***	0.252***	0.086***	0.161***	0.233***	0.247***	0.200***	0.348***
	(0.021)	(0.021)	(0.012)	(0.012)	(0.023)	(0.022)	(0.023)	(0.025)
Undergraduate	0.126***	0.112***	-0.008	0.040***	0.150***	0.131***	-0.006	0.071***
	(0.014)	(0.014)	(0.013)	(0.012)	(0.017)	(0.017)	(0.022)	(0.021)
Master or higher	0.045**	0.027	0.019	0.033**	0.044**	0.020	0.033	0.058**
	(0.019)	(0.019)	(0.020)	(0.015)	(0.022)	(0.022)	(0.034)	(0.027)
Being married	-0.051***	-0.053***	0.018	-0.016	-0.064***	-0.066***	0.029	-0.028
	(0.015)	(0.015)	(0.012)	(0.011)	(0.018)	(0.018)	(0.020)	(0.020)
Mathematical capability	0.024***	0.009*	-0.003	0.007**	0.030***	0.012**	-0.003	0.013***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)
White and non-Hispanic	0.010	0.004	-0.091***	-0.071***	0.022	0.014	-0.143***	-0.115***
	(0.020)	(0.020)	(0.013)	(0.011)	(0.024)	(0.024)	(0.020)	(0.019)
Number of financially depended children	0.018**	0.019**	0.056***	0.047***	0.019**	0.021**	0.085***	0.077***
	(0.007)	(0.007)	(0.005)	(0.005)	(0.009)	(0.009)	(0.008)	(0.008)

Table4. Cont.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	**Mobile banking**	**Mobile banking**	**Mobile payments**	**Mobile transfer**	**Mobile banking**	**Mobile banking**	**Mobile payments**	**Mobile transfer**
Risk attitude	0.014***	0.010***	0.040***	0.030***	0.014***	0.009***	0.066***	0.052***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)
Credit record rating	0.004	-0.003	-0.017***	-0.031***	0.006	-0.003	-0.030***	-0.056***
	(0.006)	(0.006)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)	(0.008)
Annual income	0.035***	0.033***	0.004	0.022***	0.041***	0.038***	0.010*	0.038***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)
Work stability	0.076***	0.076***	0.041***	0.047***	0.092***	0.093***	0.068***	0.081***
	(0.008)	(0.008)	(0.006)	(0.005)	(0.010)	(0.010)	(0.010)	(0.009)
Participating in the financial markets	0.132***	0.116***	0.066***	0.101***	0.165***	0.143***	0.110***	0.176***
	(0.015)	(0.014)	(0.009)	(0.009)	(0.018)	(0.017)	(0.015)	(0.015)
Desirable financial behaviors	-0.024***	-0.031***	-0.008*	-0.037***	-0.029***	-0.037***	-0.014*	-0.064***
	(0.006)	(0.006)	(0.005)	(0.004)	(0.008)	(0.008)	(0.008)	(0.007)
Constant	1.177***	1.071***	1.161***	1.228***				
	(0.040)	(0.042)	(0.035)	(0.030)				
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26482	26482	26482	26482	26482	26482	26482	26482
Adjusted R^2	0.118	0.122	0.171	0.248	0.047	0.049	0.089	0.128

Standard errors in parentheses
$^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

5.3 Over confidence, Lack confidence and The Use of MFS

Based on whether consumers overestimated their financial literacy, the sample was further divided into three types: over-evaluated, under-evaluated, and correctly-evaluated. The sample is classified as over-evaluated if its objective financial knowledge score isfalling short of the mean for the whole sample but its subjective self-assessment is exceeding the mean for the whole sample. Meanwhile, the sample is considered to have under-evaluated its financial literacy if its objective financial knowledge score isgreater than the average score of the entire dataset but its subjective self-assessment is below the mean of the entire sample. In short, consumers who overestimate or underestimate their financial literacy lack a clear understanding of their own financial literacy. However, for correctly assessed consumers, their objective financial scores and subjective self-assessments should be generally consistent, which means that both should be higher than the mean or below the mean.

Accordingly, this study constructs three categorical variables to measure whether consumers overestimated their financial literacy. Table 5 shows the regression results of whether consumers overestimate their financial literacy on the frequency of using MFS.

The finding shows suggest that consumers who overestimate their financial literacy are more likely than others to use mobile payments (Coef = 0.242, $p < 0.01$) and mobile transfers(Coef = 0.13, $p < 0.01$), as both of their coefficients are significantly positive. Under-evaluated financial literacy consumers, on the other hand, their frequency of using mobile payments(Coef =-0.088, $p < 0.01$) and mobile transfers(Coef =-0.061, $p < 0.01$) significantly lower than the consumers in other categories. Meanwhile, even if consumers correctly assess their financial literacy, they also use mobile payments(Coef =-0.203, $p < 0.01$) and mobile transfers(Coef =-0.105, $p < 0.017$) at a lower frequency than the consumers in other categories.

Table5. Regression results of whether consumers overestimate their financial literacy on the use of financial mobile services

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**Mobile payments**	**Mobile transfer**	**Mobile payments**	**Mobile transfer**	**Mobile payments**	**Mobile transfer**
Over-evaluated financial literacy	0.242***	0.130***				
	(0.017)	(0.019)				
Under-evaluated financial literacy			-0.088**	-0.061**		
			(0.036)	(0.027)		
Correct-evaluated financial literacy					-0.203***	-0.105***
					(0.016)	(0.017)
Male	0.122***	-0.055***	0.103***	-0.065***	0.116***	-0.059***
	(0.018)	(0.018)	(0.017)	(0.019)	(0.017)	(0.018)
Age 18 to 24	0.904***	1.326***	0.924***	1.336***	0.905***	1.326***
	(0.043)	(0.046)	(0.044)	(0.047)	(0.043)	(0.046)
Age 25 to 34	0.852***	1.275***	0.867***	1.283***	0.854***	1.276***
	(0.035)	(0.034)	(0.035)	(0.034)	(0.035)	(0.034)
Age 35 to 44	0.657***	1.009***	0.676***	1.019***	0.658***	1.010***
	(0.031)	(0.033)	(0.031)	(0.034)	(0.032)	(0.033)
Age 45 to 54	0.456***	0.708***	0.458***	0.709***	0.452***	0.706***
	(0.027)	(0.025)	(0.027)	(0.024)	(0.027)	(0.024)
Age 55 to 64	0.223***	0.362***	0.224***	0.363***	0.218***	0.359***
	(0.023)	(0.025)	(0.023)	(0.025)	(0.023)	(0.025)
Bachelor	-0.012	0.076***	-0.028	0.068***	-0.021	0.071***
	(0.022)	(0.021)	(0.022)	(0.021)	(0.022)	(0.021)
Master or higher	0.050	0.083***	0.027	0.070***	0.038	0.076***
	(0.034)	(0.026)	(0.034)	(0.026)	(0.034)	(0.026)
Being married	0.024	-0.032	0.029	-0.030	0.026	-0.031
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Mathematical capability	0.009	0.028***	0.015***	0.031***	0.011**	0.029***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
White and non-Hispanic	-0.167***	-0.132***	-0.176***	-0.137***	-0.172***	-0.135***
	(0.021)	(0.020)	(0.022)	(0.021)	(0.022)	(0.020)

Table5. Cont

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**Mobile payments**	**Mobile transfer**	**Mobile payments**	**Mobile transfer**	**Mobile payments**	**Mobile transfer**
Number of children	0.096***	0.085***	0.102***	0.087***	0.098***	0.086***
	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)
Credit record rating	-0.021***	-0.046***	-0.017**	-0.044***	-0.020***	-0.045***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)
Annual income	0.016***	0.045***	0.013***	0.043***	0.016***	0.044***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
Work stability	0.076***	0.088***	0.081***	0.091***	0.077***	0.089***
	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)	(0.009)
Participating in the financial markets	0.197***	0.255***	0.180***	0.246***	0.195***	0.254***
	(0.015)	(0.013)	(0.015)	(0.014)	(0.015)	(0.014)
Desirable financial behaviors	-0.003	-0.052***	-0.001	-0.051***	-0.001	-0.051***
	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26482	26482	26482	26482	26482	26482
Pseudo R^2	0.077	0.121	0.073	0.120	0.076	0.121

Standard errors in parentheses

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

5.4 Robustness Check

Table 6 exhibits the robustness check of the findings.This study substitutes the ordered probit regression with the ordered logit regression model. Columns (1), (2) and (3) show the outcomes of logit regression, with no constant term results being reported. Then, the study excluded observations with annual incomes falling below$15000or exceeding $300,000 and the outcomes display in Columns (4), (5) and (6).

According to the results in Table 6, whether it is replaced by the logit model or outliers are removed, the relationship between consumers' objective and SFL levels and MFS remains robust. Specifically, the higher the level of OFL, the frequency of consumers using mobile banking will significantly increase, and the frequency of using mobile payments and mobile transfers will significantly decrease. While the level of SFL increases, there is a significant rise in the frequency of consumers utilizing mobile banking, mobile payments, and mobile transfers.

Table 6. Robustness Check

	(1)	(2)	(3)	(4)	(5)	(6)
	Mobile banking	**Mobile payments**	**Mobile transfer**	**Mobile banking**	**Mobile payments**	**Mobile transfer**
OFL	0.052***	-0.112***	-0.038***	0.038***	-0.063***	-0.017***
	(0.009)	(0.009)	(0.010)	(0.006)	(0.006)	(0.006)
SFL	0.078***	0.125***	0.090***	0.034***	0.078***	0.055***
	(0.012)	(0.012)	(0.011)	(0.008)	(0.008)	(0.007)
Male	-0.202***	0.116***	-0.202***	-0.115***	0.075***	-0.106***
	(0.033)	(0.031)	(0.033)	(0.021)	(0.019)	(0.021)
Age 18 to 24	1.342***	1.508***	2.356***	0.725***	0.785***	1.255***
	(0.071)	(0.074)	(0.079)	(0.042)	(0.041)	(0.049)
Age 25 to 34	1.510***	1.399***	2.215***	0.897***	0.765***	1.254***
	(0.060)	(0.061)	(0.062)	(0.036)	(0.037)	(0.036)
Age 35 to 44	1.280***	1.115***	1.768***	0.771***	0.570***	0.988***
	(0.053)	(0.053)	(0.056)	(0.031)	(0.033)	(0.037)
Age 45 to 54	1.001***	0.791***	1.265***	0.616***	0.390***	0.682***
	(0.046)	(0.048)	(0.045)	(0.025)	(0.029)	(0.026)
Age 55 to 64	0.438***	0.424***	0.693***	0.283***	0.198***	0.360***
	(0.039)	(0.045)	(0.048)	(0.022)	(0.024)	(0.027)
Some college to Bachelor's degree	0.206***	-0.013	0.129***	0.107***	-0.003	0.073***
	(0.029)	(0.038)	(0.036)	(0.019)	(0.025)	(0.019)
Post graduate degree or higher	0.023	0.067	0.112**	0.035	0.027	0.065**
	(0.037)	(0.058)	(0.047)	(0.024)	(0.036)	(0.028)
Being married	-0.110***	0.060*	-0.060*	-0.043***	0.029	-0.037*
	(0.030)	(0.035)	(0.035)	(0.016)	(0.022)	(0.020)
Mathematical capability	0.014	-0.015	0.017**	0.023***	-0.001	0.012**
	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.005)
White and non-Hispanic	-0.001	-0.261***	-0.221***	0.007	-0.145***	-0.117***
	(0.042)	(0.036)	(0.035)	(0.027)	(0.022)	(0.022)
Number of financially depended children	0.048***	0.149***	0.142***	0.027***	0.088***	0.080***
	(0.015)	(0.013)	(0.013)	(0.010)	(0.008)	(0.007)
Risk attitude	0.020***	0.124***	0.099***	0.012***	0.068***	0.054***
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.003)
Credit record rating	-0.022*	-0.053***	-0.099***	-0.015**	-0.032***	-0.066***
	(0.012)	(0.013)	(0.013)	(0.007)	(0.008)	(0.008)
Annual income	0.064***	0.019**	0.073***		0.011*	0.040***
	(0.008)	(0.009)	(0.010)		(0.006)	(0.006)
Work stability	0.148***	0.124***	0.142***	0.084***	0.074***	0.079***
	(0.017)	(0.017)	(0.015)	(0.012)	(0.010)	(0.010)
Participating in the financial markets	0.197***	0.206***	0.312***	0.149***	0.102***	0.163***
	(0.029)	(0.026)	(0.026)	(0.019)	(0.016)	(0.016)
Desirable financial behaviors	-0.083***	-0.030**	-0.120***	-0.030***	-0.015*	-0.060***
	(0.013)	(0.012)	(0.013)	(0.008)	(0.009)	(0.009)
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26482	26482	26482	23078	23078	23078
Pseudo R^2	0.056	0.100	0.142	0.053	0.095	0.138

Notes: ***, ** and * represent 1%, 5%, and 10% significance level, respectively, and the figures within parentheses denote robust standard errors.

6. Conclusions and Implications

In this study, the associations between consumer financial literacy and the use of MFS are examined by utilizing the National Financial Capability Study (NFCS). Financial literacy was measured by two sets of variables: SFL and OFL. In addition, this study takes three types of MFS into consideration: mobile bank, mobile payments and mobile transfer. Results indicate that both OFL and SFL increased the usage of mobile banking. However, for mobile payments and mobile transfers, OFL and SFL shows the different influencing. Specifically, OFL is negatively associated the usage of mobile payments and mobile transfers while SFL increased their use. The findings contribute to the existing research on MFSby investigating the potential influence of consumer financial literacy on the usage of MFS. In addition, based on the gap between SFL and OFL, a variable to proxy one's confidence on financial confidence from over-evaluated, under-evaluated and correct-evaluated three aspects, are developed. The estimation results suggest that individuals who over-evaluated their financial literacy use MFS more often than individual who under-evaluated or correct-evaluated their financial literacy.

Based on the conclusions, strategies to improve the usage of MFS could be executed through the following perspectives:

(1) Financial educators: During the process of imparting financial knowledge, educators should stimulate and maintain the enthusiasm of students for learning. To achieve this, it's necessary for educators give positive feedback to their students. Furthermore, educators shouldobserve the traits of each student. By taking into account the students' existing financial knowledge and their individual interests, educators can design different teaching strategies. By providing customized learning resources and pathways, students can pick up financial knowledge at their own pace and process of financial learning become more efficient and enjoyable.

(2) Regulatory Agencies: For regulatory agencies, building a fair, transparent, and efficient financial market is necessary to enhance investors' financial confidence. In such a market, investors can fully practice their financial knowledge and obtain benefits equivalent to their abilities. Specifically, regulatory agencies need to ensure the fairness of market rules, prevent manipulation and fraud, and provide investors with a fair-trading environment. Meanwhile, it's also important to strengthen information disclosure requirements and improve market transparency so that investors can make decisions based on sufficient information. In addition, regulatory agencies should optimize the regulatory framework, reduce administrative intervention, improve market liquidity and allocation efficiency, and encourage

financial innovation to meet investor needs. Finally, protecting the rights and interests of investors is also an important aspect of supervision. It is necessary to establish a complete protection mechanism and dispute resolution procedures to ensure investors can receive timely assistance when their rights are damaged.

(3) Mobile financial service operators: First, operators need to eliminate user concerns about service security, which may involve strengthening technical support, simplifying user interface design, and clarifying fee structures. Through these measures, the transparency and ease of use of services can be improved, thereby attracting users to try and adopt MFS. Secondly, in view of the differences in users' perceptions of mobile finance, operators should implement a multi-channel financial education strategy. This includes popularizing the knowledge of mobile payments and transfers through social media, customer service hotlines, online seminars, and offline events, and teaching users how to use these services safely and efficiently. Especially for user groups with high OFL, operators need to provide more in-depth financial knowledge and professional consulting services to meet their needs for high-quality financial services. Additionally, given that studies have found that mobile payments and transfers are used less frequently by users with higher financial literacy, operators must pay special attention to winning the trust of this group of users. This may mean providing higher standards of security measures, such as strengthened encryption technology, strict user authentication, and improved risk control mechanisms. At the same time, by providing customized financial product recommendations and user behavior analysis, operators can better meet the personalized needs of these users.

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