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Digital financial inclusion and household happiness: The role of financial behaviors in China

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ABSTRACT

Household happiness plays a fundamental role in shaping daily lives. In the technology era, digital financial inclusion (DFI) significantly influences household happiness. Despite the growing interest in DFI, existing studies have yet to analyze its specific impact on household happiness. In response, this study aims to fill this gap through an in-depth examination of the relationship between DFI and household happiness, with financial behaviors as a mediator. Additionally, this study adopts financial literacy (FL) as a moderator in the DFI-financial behavior relationship. By employing the Peking University DFI Index of China (DFIIC) and data from the China Household Finance Survey (CHFS), this study finds that DFI significantly positively influences household happiness. Borrowing and saving behaviors exhibit a significant negative impact on household happiness. Spending behavior had no intermediary role in household happiness. Furthermore, investing behavior plays a partial intermediary role in enhancing household happiness. Regarding the moderating effect of FL, the results suggest that higher FL increases household happiness but reduces the marginal positive effect of DFI. This indicates a complex interplay between DFI and financial literacy. This study contributes by testing the mediating role of financial behaviors in the relationship between DFI and household happiness. Additionally, the findings on the moderating effect of financial literacy offer novel insights for policymakers to design inclusive policies that enhance people's well-being. Lastly, future research may focus on how financial behaviors influence the DFI-household happiness relationship.

Contribution/ Originality: This study contributes to the existing literature by integrating digital financial inclusion, financial literacy, and financial behaviors to explain household happiness. Utilizing data from the China Household Finance Survey (CHFS), this study offers clearer insights into how digital finance influences household happiness within an inclusive financial ecosystem.

1. INTRODUCTION

DFI is the process of providing affordable financial products and services through digital channels to those who are underserved or unbanked. However, technological advancements have afforded increasing access to various financial services, including risk management, credit, savings, and payments easily (Chen & Yuan, 2021; Ozturk & Ullah, 2022). This increased access not only supports financial stability but also enhances overall well-being. As household happiness and well-being are increasingly recognized as key outcomes of development, the motivation to

achieve a better future becomes even stronger, with household happiness as a driving factor (Ribeiro & Santos, 2019). Household happiness, defined as satisfaction with the overall quality of life (Veenhoven, 2013), has become a powerful motivator for individuals to strive for a better future (Ribeiro & Santos, 2019). Many countries, including China, are prioritizing policies that promote household happiness and well-being, recognizing their significance in fostering a prosperous society. In the new era of socialism with Chinese characteristics, the Chinese people are aspiring to an even brighter future, and policymakers have been dedicated to enhancing the public's sense of household happiness and security (Xin, 2021).

Although China's rapid GDP growth has raised living standards, household happiness has not increased proportionately (Yang, Ma, Deng, & Pi, 2022). This paradox highlights the need to examine other drivers of well-being, including digital financial inclusion. DFI plays a crucial role in contemporary economies, as it offers underserved communities access to essential financial services and products. Examples of these financial services and products include credit facilities, savings accounts, and payment systems. Despite China having experienced remarkable economic progress and offering various digital financial tools over the past decade, household happiness does not fully align with these economic accomplishments.

Therefore, it is crucial to investigate the extent to which DFI initiatives enhance household happiness. This study provides empirical evidence regarding the influence of DFI on financial behaviors, with FL as a moderator. Furthermore, this study employs mediation analysis to examine how these behaviors mediate the DFI-household happiness relationship. Additionally, this research evaluates the significance of FL and explores strategies for enhancing individuals' FL through moderation analysis. Specifically, this study aims to answer the following questions:

i. What is the DFI-household happiness relationship?
ii. What is the DFI-financial behaviors (borrowing, spending, investing, and saving) relationship?
iii. How does FL moderate the DFI-household happiness relationship?
iv. How do financial behaviors mediate the DFI-household happiness relationship?

First, this study formulates research questions based on the context of DFI and its relationship with household happiness. Second, in light of the research questions, this study conducts a comprehensive literature review to identify the limitations of existing studies and clarify specific research questions. Third, based on the theoretical analysis framework, this study rigorously tests each component through an econometric model. Fourth, this study concludes with policy recommendations and future prospects.

Lastly, this study contributes by (i) studying the relationship between digital financial inclusion and household happiness, (ii) identifying the mediating roles of borrowing, spending, investing, and saving behaviors, and (iii) identifying the moderating effect of financial literacy. Besides that, the findings of this study are expected to offer novel insights for policymakers to design inclusive policies that enhance the well-being of the people.

2. LITERATURE REVIEW

2.1. DFI and Household Happiness

The study of household happiness gained momentum in the 1980s, significantly influenced by sociologist Veenhoven (2013), whose work sparked extensive research on household happiness, with dedicated databases and scientific journals focused on this subject established (Ribeiro & Santos, 2019). According to Yin, Li, and Yang (2021), the early literature on household happiness mainly focused on philosophy, psychology, sociology, and related fields, and economists' attention to household happiness began with the "Easterlin paradox." Household happiness has become a goal for local councils in the UK since the 2004 Care Act, and the UK has long remained at the forefront of well-being policymaking (Frijters, Clark, Krekel, & Layard, 2020). By the 21st century, "household happiness economics," as an important index measuring the government's work, arises at a historic moment (Yin et al., 2021). Economists have extensively combined the research methods of economics, psychology, sociology, ethics, and other

disciplines to conduct research on household happiness and contributed to the interdisciplinary and multi-level characteristics of household happiness economics (Yin et al., 2021). In the early 21st century, the notion of household happiness emerged as a significant focus in both social discussions and practices in China. This shift moved away from traditional cultural fatalism to a more proactive perspective on well-being. The Chinese government adopted the household happiness index as an indicator of effective governance (Yan, 2021).

Previous research has indicated that various factors, including genetic factors and people's beliefs and ideas towards household happiness (Bartels, 2015; Wong & Yuen, 2023) local environment where they live (Bonasia, De Simone, D'Uva, & Napolitano, 2022; Zheng et al., 2022) economic factors (Green, 2011; Nguyen & Le, 2021; Văn & Bảo, 2022) and financial technology (Yin et al., 2021) have a positive or negative impact on household happiness. A previous study conducted by Frey (2018) found that there were several key factors that influenced household happiness, such as genetic predispositions, socio-demographic characteristics, and physical and mental well-being. Besides that, other studies also revealed that genetic factors, beliefs, and ideas towards household happiness also contribute to household happiness (Bartels, 2015; Wong & Yuen, 2023). Some studies also revealed that environmental factors such as environmental protection and PM2.5 can affect household happiness (Bonasia et al., 2022; Lee, Song, & Lim, 2022; Zheng et al., 2022).

Information and communication technologies (ICTs) have played an important role in expanding financial inclusion, which has given rise to the concept of digital financial inclusion (DFI) (Gallego-Losada, Montero-Navarro, García-Abajo, & Gallego-Losada, 2023). In simple terms, DFI uses technology to make financial services more accessible to individuals and businesses, helping them participate in the digital financial system regardless of their circumstances. A growing body of research highlights how financial inclusion can affect personal well-being and household happiness. Access to financial services can ease financial stress, support household spending needs, and improve life satisfaction. For instance, Yin et al. (2021) found that fintech development could enhance the well-being of rural populations. Additionally, Li, Chen, and Liu (2024) found that inclusive finance can significantly moderate the positive influence of social networks on well-being. However, the DFI-household happiness relationship remains relatively unexplored. However, findings are not always consistent.

2.2. DFI and FI

Effectively navigating the complexities inherent in the digital financial environment necessitates an intensified focus on enhancing financial literacy to facilitate informed decision-making. Financial inclusion has emerged as a priority within developing countries' initiatives aimed at alleviating poverty and integrating marginalized groups into mainstream economic systems. The advent of innovative financial services and digital technologies has successfully facilitated access and utilization through improved digital financial literacy (Kamble, Mehta, & Rani, 2024).

There are varied viewpoints on the definition of FL. As mentioned by Lucey, Agnello, and Laney (2015), FL is the skill to grasp and utilize the mechanisms and instruments pertinent to personal finance. Conversely, Lusardi and Mitchell (2014) assert that FL embodies a capability for the interpretation of economic data and informed decision-making concerning wealth building, financial planning, debt management, and retirement funds. This encompasses an understanding of commercial and financial principles, financial proficiency, budgeting, and planning for the future (Gallardo & Libot, 2017). It concerns how individuals obtain, manage, and amass fortune for their own disposal and involves a focus on money as a tool to achieve one's life goals (Lucey et al., 2015). It has been considered one of the vital factors influencing access to financial services and promoting inclusive finance (Azeez & Akhtar, 2021; Hasan, Le, & Hoque, 2021). Following the global financial crisis, policymakers across the world have voiced significant concerns regarding the pervasive issue of inadequate financial literacy (Lusardi & Mitchell, 2014). This shortfall in financial knowledge also hindered rural populations' access to financial services (Hasan et al., 2021). For example, many rural people have remained financially excluded, and some of them do not know about banking services in

Bangladesh (Aziz & Naima, 2021; Hasan et al., 2021). In addition, the lower the FL, the more demotivated the countries are to adopt digital financial services (Azeez & Akhtar, 2021; Ozili, 2018; Tay, Tai, & Tan, 2022).

FL has been an important aspect of human life (Simental, 2020). For example, knowledge about how to budget, invest, and save successfully is essential to a fulfilling debt-free life (Simental, 2020). Existing research has suggested that high FL levels facilitate participation in the financial marketplace and help avoid fraud and costly mistakes (Lyons & Kass-Hanna, 2021; Morgan, Huang, & Trinh, 2019).

2.3. DFI and FL

A comprehensive suite of financial practices encompasses numerous financial activities such as expenditure, lending, saving, investment, and financial management. It has been demonstrated that DFI will affect financial behaviors, including borrowing, spending, investing, and saving behaviors. For example, Zhao, Li, and Yan (2024) discovered that with the popularity of digital finance, mobile payments have resulted in over-consumption. Xu and Sun (2022) indicated that inclusive finance significantly increased investment participation. Saving is considered an important financial behavior. Both objective and subjective financial circumstances influence the ability to save (Maison, Marchlewska, Sekścińska, Rudzinska-Wojciechowska, & Łozowski, 2019). However, educational attainment does not influence the relationship between risk attitude and household consumption behavior (Xie, Tong, & Xu, 2022). According to Ahn and Nam (2022), objective financial knowledge might be insufficient for the effective prevention of risky credit card practices. Furthermore, a higher degree of FL could potentially adversely affect financial status (Gilenko & Chernova, 2021). Potential failure to fully utilize financial knowledge often leads to overconfidence in one's knowledge and can negatively impact future financial situations. For example, a junior investor who exhibits overly high enthusiasm about the higher returns of financial assets relative to bank deposits after an introductory course in financial investing may not be sufficiently aware that the risks of investing in such assets are greater than those of investing in these deposits. It seems that the situation is even worse for youth, as many online games provide investment opportunities with very high returns and very little risk. The only thing players (mostly teenagers) need is money and a proper online account. There's no age limit. All in all, financial technology (fintech), financial behaviors, and FL were indeed mutually reinforcing, and fintech was expected to increase financial inclusion and FL (Moenjak, Kongprajya, & Monchaitrakul, 2020).

Lending practices, especially overdue online loans, can lead to increased economic stress, affecting quality of life and even basic expenses, thereby reducing household happiness. Existing studies have demonstrated that debt negatively affects household happiness. The more convenient accessibility of credit markets creates additional risks of debt traps (Yue, Korkmaz, Yin, & Zhou, 2022). For example, Jantsch and Veenhoven (2019) indicated that the 'pleasure' of paying for goods with a credit card is shorter-lasting and even less painful than the 'pain' of being in debt. Total household debt, including housing debt and education debt, has a significant negative influence on household happiness (Liu, Zhong, Zhang, & Li, 2020). Meng and Xiao (2023) found that digital finance, through the rising debt burden and overspending behavior, negatively influences household happiness. Regarding different demographic groups, (Kim & Woo, 2020) concluded that student loans are overall negatively associated with the household happiness of college students as well.

Consumption could affect household happiness as well. Prosocial spending increased positive affect (Aknin, Dunn, & Norton, 2012; Aknin, Dunn, Proulx, Lok, & Norton, 2020; Dunn, Aknin, & Norton, 2014; Moche & Västfjäll, 2022; Yamaguchi et al., 2016). Personality-matched spending increased household happiness (Matz, Gladstone, & Stillwell, 2016). Online shopping improved life satisfaction as well (Guillen-Royo, 2019). Interestingly, greater online shopping consumption positively influences the household happiness of rural residents (Zheng & Ma, 2021). In addition, existing studies demonstrated that consumption positively affects household happiness (Wang, Cheng, & Smyth, 2019; Zhu, Ma, Leng, & Nie, 2021).

However, Khan, Rabbani, and Kadoya (2021) found that high FL levels increased the possibility of greater investments in risky assets. Peng, She, and Lin (2022) indicated that the knowledge of portfolio diversity increased as educational attainment and FL grew. While individuals whose investments yielded profits reported slightly higher levels of household happiness compared to the general population, this increase was not statistically significant. Conversely, investment losses were associated with a significant rise in household happiness, suggesting that such losses exert a more pronounced negative effect on overall well-being. It has been demonstrated that well-being decreased by participation in risky financial investments (Du, Zhou, Yang, & Du, 2023).

DFI has an intricate and multifaceted impact on savings behavior, potentially resulting in either a decrease or an increase in savings rates. The outcome is contingent upon the implementation of DFI and individual actions and decisions. Savings provide financial security by serving as a hedge against risk, thereby enhancing the financial stability of individuals and families. Savings enhance overall well-being by creating psychological security (Kapounek, Korab, & Deltuvaite, 2016; Maison et al., 2019) and in turn, further affect household happiness.

Meng and Xiao (2023) studied how financial literacy and digital financial inclusion affect well-being, while Yin et al. (2021) looked at how financial inclusion reduces the gap between income and happiness. However, both studies did not explained the specific ways digital financial inclusion influences household happiness. This study intends to overcome the gap in two ways. First, this study examines financial behaviors (borrowing, spending, investing, and saving) as mediators to show how digital financial inclusion works through these channels. Second, this study tests financial literacy as a moderator, showing that it can increase happiness but also reduce the extra effect of digital financial inclusion. In this way, this study provides a clearer picture of how digital finance and household factors affect happiness.

3. RESEARCH METHODOLOGY

3.1. Hypothesis Development

According to Self-Determination Theory, DFI can foster household happiness by fulfilling the basic psychological needs for competence, autonomy, and relatedness. DFI strengthens control over personal finances, promotes the growth of financial skills, and enables social interactions, significantly improving overall well-being and life satisfaction. Thus, this study hypothesizes that the higher the DFI levels, the greater the household happiness.

Hypothesis 1: DFI is significantly correlated with household happiness.

Liquidity constraints, financial literacy (FL), digital financial inclusion (DFI), and household happiness are closely linked. The Theory of Liquidity Constraints explains that people often face difficulties in turning assets into cash without losing value. Such barriers can affect major financial choices and overall well-being. For example, limited access to credit or high transaction fees may discourage investment in education or healthcare, even though these improve long-term security. FL is the ability to understand and use financial concepts such as saving, budgeting, debt management, and investing. People with higher FL can make better financial decisions, avoid costly mistakes, and manage resources effectively. This often leads to stronger financial outcomes and greater household happiness. DFI involves the use of technology to deliver financial services to those without traditional bank access. Examples include mobile banking, online payments, and other fintech solutions. By making financial products more accessible and affordable, DFI helps reduce liquidity constraints, supports better money management, and enhances overall well-being.

Hypothesis 2: FL moderates the DFI-household happiness relationship.

DFI provides essential financial support and security through borrowing and enhances a sense of autonomy and control. Hence, this study hypothesizes that borrowing behavior negatively affects household happiness.

Hypothesis 3a: Borrowing behavior significantly mediates the relationship between DFI and household happiness.

The set point theory argues that household happiness usually settles at a stable level, shaped mostly by genetics and personality. External factors, like changes in income or circumstances, have only a limited effect. While digital

financial inclusion (DFI) can make financial services more accessible and encourage spending, the theory suggests that such consumption will not lead to lasting gains in happiness. People tend to adapt quickly to changes, so any boost from higher spending is only temporary. This means that DFI, on its own, cannot increase household happiness simply by driving more consumption.

Hypothesis 3b: Spending behavior significantly mediates the relationship between DFI and household happiness.

The relationships between Precautionary Saving Theory, investment behavior, DFI, and household happiness are complex. Exploring these connections helps explain how people make financial decisions that improve both financial security and life satisfaction. DFI plays a central role by providing easier access to financial services and knowledge, which strengthens personal financial management and supports long-term goals. This study hypothesizes that there is a positive impact of investment behavior on household happiness.

Hypothesis 3c: Investing behavior significantly mediates the relationship between DFI and household happiness.

The Life Cycle Hypothesis emphasizes the significance of financial planning and saving at every stage of life. Digital financial inclusion (DFI) facilitates this process by providing access to digital services, credit, and investment opportunities. These tools assist individuals in working toward long-term goals and mitigating the effects of financial shocks. Consequently, DFI can play a vital role in enhancing household happiness and well-being. Based on this review, this study hypothesizes that saving behavior is positively related to household happiness.

Hypothesis 3d: Saving behavior has a significant mediating effect on the relationship between DFI and household happiness.

3.2. The Data Sources

This study explores the effect of digital financial inclusion (DFI) on household happiness using the Digital Financial Inclusion Index of China (DFIIC). The index was developed by the Digital Finance Research Center at Peking University, in collaboration with Ant Financial Services Group and with support from the Chinese government. DFIIC has been widely used in academic research (Ji, Shi, & Zhang, 2022; Lin & Zhang, 2023; Liu, Luan, Wu, Zhang, & Hsu, 2021). Additionally, this study incorporates data from CHFS, a nationwide sampling survey conducted by the China Household Finance Survey and Research Center at Southwestern University of Finance and Economics. Notably, CHFS has been extensively utilized in previous research (Liu, Zheng, & Yu, 2023; Wu & Wang, 2023; Xie, Zhang, Yao, Chen, & Wang, 2022).

3.3. Variables

This study follows Meng and Xiao (2023) and Tian (2022) in utilizing the ratios of saving, spending, investment, and borrowing. The use of ratios, particularly in financial and scientific contexts, helps stabilize variance and enhances data comparability. For instance, financial ratios, such as return on assets or profit margins, standardize data across companies of varying sizes, potentially improving normality in distribution. Additionally, this study adopts the approach of Tan, Guo, and Wu (2024) by addressing the influence of extreme values on model results. This analysis considers borrowing-to-asset and spending-to-asset ratios exceeding 1 as abnormal in China. Since these extreme values are rare but may skew results, they were removed from the dataset. In total, 720 borrowing behavior observations and 833 consumption behavior observations with values greater than 1 were excluded, along with 9,179 observations containing missing values. After data processing, the final sample size was 23,911. Following Jiang, Hu, and Cao (2024), the DFI index was divided by 100. For comparison, Jiang et al. (2024) obtained 22,101 valid sample points, while Tan et al. (2024) reported a benchmark analysis sample of 20,919.

In this study, observations with a ratio above 1 were treated as outliers and removed. The reason is that such values are not only extreme statistically but also lack economic meaning. For instance, ratios above 1 would imply financial behaviors or outcomes that are unrealistic in a household context (e.g., borrowing or expenditure levels exceeding feasible household income). These outliers could also distort the estimation results and produce misleading

relationships. Therefore, removing these outliers ensures that the analysis reflects economically reasonable behavior and produces findings that are more reliable for policy and practical implications.

To further account for household financial conditions, this study includes controls for homeownership status, employment status, total wealth, and disposable income. Additional key control variables encompass demographic and socioeconomic factors such as gender, age, education, health, marital status, working hours, and overtime hours. FL is examined as a moderating factor in the relationship between DFI and financial behaviors. FL refers to an individual's ability to acquire, manage, and accumulate financial resources effectively to achieve personal objectives (Lucey et al., 2015).

3.4. Econometric Model

According to Yoon (2020), in causality, the mediating variable causes the mediating effect in the dependent and independent variables. With x as a predictor and y as a response variable, w moderates the x-y causal relationship. Moderating variables affect the strength of the relationship between dependent and independent variables. Mediating or moderating analysis can be conducted in conditions of many complex causal relationships, taking into account the presence of moderators or mediators. This study adopts household happiness as the dependent variable, while the DFI index is the independent variable. This research aims to control for all factors influencing household happiness except for the DFI index, FL levels, and financial behaviors. FL has been examined to moderate the DFI-household relationship. Additionally, financial behaviors are examined to be a mediator in the DFI-household relationship.

Ordered categorical data is increasingly significant across various research domains, including assessments of patient quality of life, life satisfaction, political ideologies, and educational attainment (Klein & Doll, 2021). In this study, household happiness serves as the dependent variable and is represented as ordered categorical data. Accordingly, following the approach of Meng and Xiao (2023) the latent regression model can be formulated as follows.

$$HH_{i,t} = \alpha_1 + \beta DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

$$BOR_{i,t} = \alpha_2 + \gamma DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

$$HH_{i,t} = \alpha_3 + \beta_1 DFI_{i,t} + \beta_2 BOR_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (3)$$

$$SPD_{i,t} = \alpha_2 + \gamma DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (4)$$

$$HH_{i,t} = \alpha_3 + \beta_1 DFI_{i,t} + \beta_2 SPD_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (5)$$

$$INV_{i,t} = \alpha_2 + \gamma DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (6)$$

$$HH_{I,t} = \alpha_3 + \beta_1 DFI_{i,t} + \beta_2 INV_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (7)$$

$$SAV_{i,t} = \alpha_2 + \gamma DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (8)$$

$$HH_{i,t} = \alpha_3 + \beta_1 DFI_{i,t} + \beta_2 SAV_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (9)$$

$$HH_{I,t} = \alpha_4 + \alpha_5 b_1 + \gamma_1 b_1 DFI_{i,t} + \gamma_2 b_1 Literacy_{i,t} + \gamma_3 b_1 Literacy_{i,t} \times DFI_{i,t} + \beta_2 DFI_{i,t} + \sum Controls + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (10)$$

Where: $HH_{i,t}$ refers to the household happiness of household i in city t; $DFI_{i,t}$ refers te the DFIIC for household i in province t; $BOR_{i,t}$ refers to the borrowing ratio of household i in city t; $SPD_{i,t}$ refers to the spending ratio of household i in city t; $INV_{i,t}$ refers to the investing ratio of household i in city t; $INV_{i,t}$ refers to the investing ratio of household i in city t; $SAV_{i,t}$ refers to the saving ratio of household i in city t; and $Literacy_{i,t}$ refers to the financial literacy of household i in city t. Formula (1) is the regression equation without the mediating variable, where α_1 is its intercept, and β is the regression coefficient that represents the marginal effect between DFI and household happiness in the absence of an intermediary variable $\sum Controls$ are the control variables. μ_i represents individual effects. λ_t is time effects. $\varepsilon_{i,t}$ is a random disturbance. Equation 2, 4, 6 and 8 represent the regression models for the mediating variable $Borrowing_{i,t}$, $Spending_{i,t}$, $Investin_{i,t}$, and $Saving_{i,t}$ for the $DFI_{i,t}$. The intercept term is denoted as α_2 and γ is its regression coefficient. γ is the marginal effect of the mediating variable on household happiness and the DFI. $\sum Controls$ are the control variables, μ_i is individual effects, λ_t is time effects, and $\varepsilon_{i,t}$ is a random disturbance.

Equation 3, 5, 7 and 9 represent the regression model for the dependent variable $\text{Household happiness}_{I,t}$ in relation to the independent variable $\text{DFI}_{i,t}$, and the mediating variable $\text{Borrowing}_{i,t}$, $\text{Spending}_{i,t}$, $\text{Investin}_{i,t}$, and $\text{Saving}_{i,t}$. The intercept term is denoted as α_3, and β_1 is the direct effect of the independent variable on the dependent variable. The mediation effect, captured by b, reflects the influence of financial behaviors on the regression coefficient of the household happiness index. $\sum \text{Controls}$ are the control variables, μ_i is individual effects, λ_t is time effects, and $\varepsilon_{i,t}$ is a random disturbance. Formula (10) represents the regression equation of the household happiness index, where the dependent variable is modeled as a function of financial behavior and the independent variable $\text{DFI}_{i,t}$ under a moderated mediation framework. The intercept term is given by $\alpha_4 + \alpha_5 b_1 + \gamma_2 b_1 \text{Literacy}_{i,t}$. $\gamma_3 b_1$ represents the effect size of the moderated mediation. $(\gamma_1 b_1 + \gamma_3 b_1 \text{Literacy}_{i,t})\text{DFI}_{i,t}$ represents the moderated mediation effect, indicating how changes in $\text{Literacy}_{i,t}$ influence the mediation effect and to what extent it varies. β_2 is the direct effects of the independent variable on the dependent variable. $\sum \text{Controls}$ are the control variables, μ_i is individual effects, λ_t is time effects, and $\varepsilon_{i,t}$ is a random disturbance.

4. RESULT

4.1. Descriptive Statistics

Table 1 presents the summary of descriptive statistics for the study variables. These variables are categorized into five sections from top to bottom: (i) outcome variables, (ii) predictor variables, (iii) intermediary variables, (iv) moderator variables, and (v) control variables. After excluding observations with missing values across these variables, the final sample size is 23,911. The dataset initially comprised 34,643 household responses. However, to ensure data completeness, responses with missing information on financial behaviors (spending, saving, debt, and assets) were removed.

Demographic variables provide essential context for the analysis. The average household size is 3.303, with most families falling within a typical range, though some outliers, with up to 15 members, reflect cultural or regional variations in family structure. The mean respondent age is 54.86 years, spanning from 16 to 97, encompassing both working-age individuals and retirees. Approximately 22% of the sample is classified as aging, while 11.6% falls into the young, indicating an overall older sample profile. Educational attainment varies significantly, with an average of 9.215 years of schooling. Additionally, health conditions are generally favorable, with a mean self-reported score of 3.01 on a 1-to-5 scale.

Table 1. Summary statistics of variables (N = 23,911).

	Variables	N	Mean	Sd.	Min.	Max.	Skewness	Kurtosis
DV	Household happiness	23,911	2.138	0.856	1	5	0.456	3.100
IV	DFI index	23,911	3.286	0.316	2.826	4.103	0.910	3.123
Mediating variables	Borrowing	23,911	0.0705	0.151	0	0.999	2.975	12.928
	Spending	23,911	0.188	0.199	0	1.000	1.855	6.193
	Investing	23,911	1.424	1.167	0	5	1.097	3.936
	Saving	23,911	0.050	0.114	0	0.993	3.945	22.004
Moderating variable	Financial literacy	23,911	1.993	2.053	0	6	0.546	1.893
Control variables	Hours	23,911	3.029	4.510	0	24	1.203	3.899
	Overtime	23,911	0.847	3.616	0	72	6.914	67.084
	Family size	23,911	3.303	1.552	1	15	0.945	4.064
	Age	23,911	54.86	12.64	16	97	-0.103	2.568
	Aging	23,911	0.220	0.347	0	1	1.421	3.562
	Younging	23,911	0.116	0.168	0	0.833	1.085	2.889
	Male	23,911	0.795	0.404	0	1	-1.459	3.130
	Educ	23,911	9.215	3.773	1	22	0.0059	3.013
	Marriage	23,911	0.888	0.315	0	1	-2.465	7.078
	Health condition	23,911	3.301	0.992	1	5	0.130	2.684

4.2. OLS Regression Analysis

Table 2 presents the results of the OLS regression analysis, indicating that an increase in DFI is positively associated with household happiness. These findings support the initial hypothesis, which posits that DFI contributes to improved household happiness. The results suggest that DFI significantly enhances subjective well-being.

Table 2. Results of OLS regression analysis.

Variables	Model (1)	Model (2)	Model (3)
	Household happiness	Household happiness	Household happiness
DFI index	0.107***	0.121***	0.102***
	(0.0174)	(0.0176)	(0.0175)
Borrowing		0.336***	
		(0.0371)	
Spending		0.0268	
		(0.0284)	
Investing		0.00952*	
		(0.00488)	
Saving		-0.135***	
		(0.0478)	
Financial literacy			0.00930***
			(0.00290)
Hours	-0.00128	-0.000884	-0.00128
	(0.00137)	(0.00137)	(0.00137)
Overtime	0.00165	0.00120	0.00150
	(0.00158)	(0.00158)	(0.00158)
Family size	-0.000619	-0.00334	-0.000764
	(0.00444)	(0.00444)	(0.00444)
Age	-0.00787***	-0.00685***	-0.00771***
	(0.000627)	(0.000637)	(0.000629)
Aging	-0.216***	-0.212***	-0.217***
	(0.0203)	(0.0203)	(0.0203)
Younging	-0.0976**	-0.105**	-0.0982**
	(0.0413)	(0.0412)	(0.0413)
Male	-0.0415***	-0.0401***	-0.0399***
	(0.0138)	(0.0138)	(0.0138)
Education	0.00805***	0.00781***	0.00631***
	(0.00161)	(0.00166)	(0.00170)
Marriage	-0.185***	-0.179***	-0.185***
	(0.0182)	(0.0181)	(0.0182)
Health condition	-0.171***	-0.165***	-0.172***
	(0.00568)	(0.00573)	(0.00569)
Constant	2.967***	2.818***	2.976***
	(0.0700)	(0.0735)	(0.0700)
Observations	23,911	23,911	23,911
R-squared	0.0630	0.0671	0.0634
Adjusted R square	0.0626	0.0665	0.0630
F statistic	146.15	114.54	134.88
P value	0.0000	0.0000	0.0000

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05.

4.3. Moderators Analysis

In general, interactions occur when the effect of an independent variable on a dependent variable varies across different levels of a moderating variable. This concept is central to understanding complex relationships in fields like psychology, sociology, and economics. Studies on moderating variables often focus on "when" or "under what conditions" an independent variable has the strongest effect on a dependent variable. For example, in psychology, research on stress and performance may look at how personality traits or coping strategies influence the link between stress levels (independent variable) and performance outcomes (dependent variable). According to Baron and Kenny

(1986), a moderating variable alters the strength or nature of this relationship, potentially changing its magnitude, direction, or form. For example, social support might strengthen the positive effects of exercise on mental health for some individuals while having little to no effect on others who lack adequate support systems. Figure 1 shows that financial literacy moderates the relationship between digital financial inclusion and happiness.

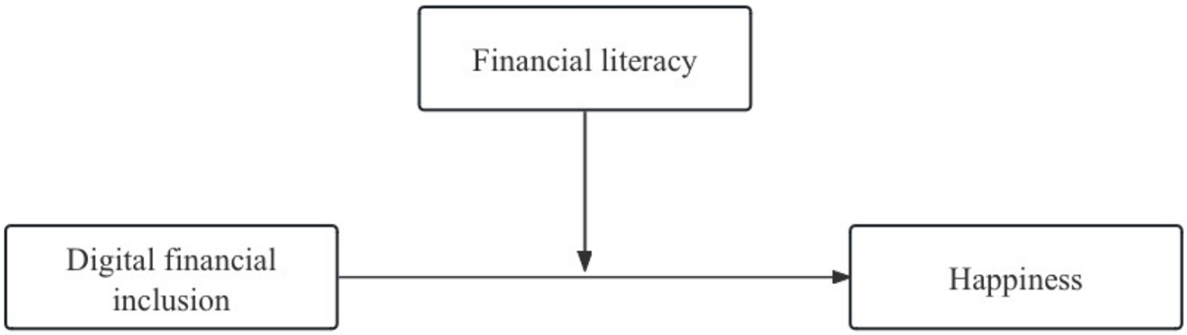

Figure 1. The relationships of the moderating effects.

FL denotes an individual's capability to understand and effectively apply financial skills, such as budgeting, investing, and managing credit. These competencies are essential for making informed financial decisions. DFI, on the other hand, is defined as the availability of technology-based platforms that provide access to financial services, including Internet banking, mobile payment systems, and tech-enabled investment avenues, bridging gaps for underserved populations who may lack traditional banking access. In this study, the interaction term constructed between DFI and FL is incorporated into the baseline regression model to explore how these variables jointly influence household happiness rather than acting independently. As such, researchers can quantify how variations in one variable affect the other when considered alongside a third factor. Table 3 presents the detailed regression results, with an emphasis on the significant moderating effect of FL on the DF-household happiness relationship. Both DFI (DFI index) and its interaction with FL (DFI index * FL) exhibit a statistically significant impact on household happiness at the 1% significance level.

The coefficient of DFI is positive, while that of its interaction term with FL is negative, indicating that FL significantly enhances household happiness. However, FL negatively moderates the DFI-household happiness relationship, contrary to the research results of Xiao and Xin (2022), who revealed a strong positive FL-DFI relationship. These results suggest that it is crucial to develop effective financial education policies to enhance overall household happiness. Interestingly, FL generally has positive implications, but it can sometimes have unintended negative effects on financial well-being. Specifically, the study finds that as FL increases, the positive influence of DFI on household happiness decreases, lending support to Hypothesis 3.

Table 3. Results of tests of influence and moderating effects.

Variables	(1)	(2)
	Household happiness	Household happiness
DFI index	0.107***	0.156***
	(0.0174)	(0.0261)
FL		0.0836***
		(0.0267)
DFI index * FL		-0.0225***
		(0.00805)
Hours	-0.00128	-0.00136
	(0.00137)	(0.00137)
Overtime	0.00165	0.00148
	(0.00158)	(0.00158)
Family size	-0.000619	-0.000713
	(0.00444)	(0.00444)

Variables	(1)	(2)
	Household happiness	Household happiness
Age	-0.00787***	-0.00775***
	(0.000627)	(0.000629)
Aging	-0.216***	-0.216***
	(0.0203)	(0.0203)
Younging	-0.0976**	-0.0972**
	(0.0413)	(0.0413)
Male	-0.0415***	-0.0398***
	(0.0138)	(0.0138)
Education	0.00805***	0.00644***
	(0.00161)	(0.00170)
Marriage	-0.185***	-0.185***
	(0.0182)	(0.0182)
Health condition	-0.171***	-0.172***
	(0.00568)	(0.00569)
Constant	2.967***	2.802***
	(0.0700)	(0.0937)
Observations	23,911	23,911
R-squared	0.063	0.064

Note: t-statistics in parentheses, *** p<0.01, ** p<0.05.

4.4. Mediation Analysis

4.4.1. Mediating Effects of Borrowing Behavior

Table 4 presents the results of the mediation analysis, which examines the role of borrowing behavior in the relationship between DFI and household happiness, indicating that the coefficient for borrowing behavior is statistically significant at the 1% level and has a negative sign. This suggests that DFI does not enhance household happiness by encouraging borrowing activities. The total effect of DFI on household happiness is 0.107, comprising a direct effect of 0.120 and an indirect effect of -0.013, mediated through borrowing behavior. These findings imply that DFI influences household happiness partly by affecting borrowing behavior. Specifically, DFI may reduce borrowing, which in turn has a negative mediating effect on the DFI-household happiness relationship.

In other words, while DFI directly enhances household happiness, its influence through increased borrowing has a counteracting negative effect. As a result, the total effect of DFI on household happiness is slightly diminished.

Table 4. Regression results of mediating effect of borrowing behaviors.

Variables	(1)	(2)	(3)
	Household happiness	Borrowing	Household happiness
Borrowing			0.352***
			(0.0367)
DFI index	0.107***	-0.0373***	0.120***
	(0.0174)	(0.00306)	(0.0174)
Hours	-0.00128	-0.00100***	-0.000928
	(0.00137)	(0.000242)	(0.00137)
Overtime	0.00165	0.00108***	0.00127
	(0.00158)	(0.000278)	(0.00158)
Family size	-0.000619	0.00515***	-0.00243
	(0.00444)	(0.000781)	(0.00443)
Age	-0.00787***	-0.00244***	-0.00701***
	(0.000627)	(0.000110)	(0.000632)
Aging	-0.216***	-0.00537	-0.214***
	(0.0203)	(0.00358)	(0.0203)
Younging	-0.0976**	0.0172**	-0.104**
	(0.0413)	(0.00726)	(0.0412)
Male	-0.0415***	-0.00182	-0.0408***
	(0.0138)	(0.00243)	(0.0138)
Education	0.00805***	-0.000162	0.00811***

Variables	(1)	(2)	(3)
	Household happiness	Borrowing	Household happiness
	(0.00161)	(0.000284)	(0.00161)
Marriage	-0.185***	-0.00903***	-0.182***
	(0.0182)	(0.00320)	(0.0181)
Health condition	-0.171***	-0.0128***	-0.166***
	(0.00568)	(0.001000)	(0.00569)
Constant	2.967***	0.365***	2.838***
	(0.0700)	(0.0123)	(0.0711)
Observations	23,911	23,911	23,911
R-squared	0.063	0.064	0.067

Note: Standard errors in parentheses.
*** p<0.01, ** p<0.05.

4.4.2. Mediating Effects of Spending Behavior

Table 5 shows the result of mediation analysis examining the impact of spending behavior on household happiness. The findings indicate that while DFI is significantly positively correlated with household happiness at the 1% significance level, spending behavior does not exhibit a significant correlation with household happiness. This suggests that spending behavior does not serve as an intermediary factor in the relationship between DFI and household happiness. Column (3) of Table 5 reports the regression results based on equation (5), where the coefficient of spending behavior is not statistically significant, indicating that DFI does not improve household happiness by increasing spending behavior. Consequently, DFI does not affect household happiness through changes in household spending behavior.

Table 5. Regression results of the mediating effect of spending behaviors.

	(1)	(2)	(3)
VARIABLES	Household happiness	Spending	Household happiness
Spending			0.0351
			(0.0281)
DFI index	0.107***	-0.0861***	0.110***
	(0.0174)	(0.00401)	(0.0176)
Hours	-0.00128	-0.000926***	-0.00125
	(0.00137)	(0.000316)	(0.00137)
Overtime	0.00165	-0.000128	0.00165
	(0.00158)	(0.000363)	(0.00158)
Family size	-0.000619	0.00543***	-0.000810
	(0.00444)	(0.00102)	(0.00444)
Age	-0.00787***	-0.00131***	-0.00783***
	(0.000627)	(0.000144)	(0.000628)
Aging	-0.216***	0.0370***	-0.218***
	(0.0203)	(0.00468)	(0.0204)
Younging	-0.0976**	0.0410***	-0.0990**
	(0.0413)	(0.00950)	(0.0413)
Male	-0.0415***	0.0229***	-0.0423***
	(0.0138)	(0.00318)	(0.0138)
Educ	0.00805***	-0.00933***	0.00838***
	(0.00161)	(0.000371)	(0.00163)
Marriage	-0.185***	-0.0187***	-0.184***
	(0.0182)	(0.00418)	(0.0182)
Health condition	-0.171***	-0.0195***	-0.170***
	(0.00568)	(0.00131)	(0.00571)
Constant	2.967***	0.664***	2.944***
	(0.0700)	(0.0161)	(0.0724)
Observations	23,911	23,911	23,911
R-squared	0.063	0.084	0.063

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05.

4.4.3. Mediating Effects of Investing Behavior

Table 6 presents the mediation analysis results for the impact of investing behavior on household happiness. The coefficient for investing behavior is statistically significant at the 5% level, indicating that DFI enhances household happiness by promoting investment activities. The total effect of DFI on household happiness is 0.107, with a direct effect of 0.106 and an indirect effect of 0.001 through investing behavior. This suggests that DFI fosters household investment, which in turn plays a positive mediating role in the DFI-household happiness relationship.

The advancement of DFI directly benefits individuals by improving access to investment services, ensuring that both individuals and institutions can leverage financial products effectively. By fostering investing behavior, DFI positively impacts household happiness while creating opportunities to invest in emerging markets and industries. At the enterprise level, DFI eases financing constraints and offers financial support.

Table 6. Regression Results of the Mediating Effect of Investing Behaviors.

Variables	(1)	(2)	(3)
	Household happiness	Investing	Household happiness
Investing			0.0100**
			(0.00488)
DFI index	0.107***	0.162***	0.106***
	(0.0174)	(0.0231)	(0.0174)
Hours	-0.00128	0.00313*	-0.00131
	(0.00137)	(0.00182)	(0.00137)
Overtime	0.00165	0.00686***	0.00158
	(0.00158)	(0.00209)	(0.00158)
Family size	-0.000619	0.0247***	-0.000867
	(0.00444)	(0.00588)	(0.00444)
Age	-0.00787***	-0.0155***	-0.00772***
	(0.000627)	(0.000831)	(0.000631)
Aging	-0.216***	-0.00904	-0.216***
	(0.0203)	(0.0269)	(0.0203)
Younging	-0.0976**	0.0128	-0.0977**
	(0.0413)	(0.0547)	(0.0413)
Male	-0.0415***	-0.0269	-0.0412***
	(0.0138)	(0.0183)	(0.0138)
Educ	0.00805***	0.0616***	0.00743***
	(0.00161)	(0.00214)	(0.00164)
Marriage	-0.185***	-0.104***	-0.184***
	(0.0182)	(0.0241)	(0.0182)
Health condition	-0.171***	0.0459***	-0.171***
	(0.00568)	(0.00753)	(0.00569)
Constant	2.967***	1.040***	2.956***
	(0.0700)	(0.0927)	(0.0702)
Observations	23,911	23,911	23,911
R-squared	0.063	0.116	0.063

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4.4. Mediating Effects of Saving Behavior

Table 7 presents the results of the mediation analysis examining the role of saving behavior in the DFI-household happiness relationship. Both DFI and saving behavior are statistically significant at the 1% level. Notably, saving behavior is negatively correlated with household happiness, suggesting that it partially mediates the impact of DFI on household happiness. Column (3) displays the regression results from equation (9), where the coefficient for saving behavior is significantly negative at the 1% level. This implies that DFI does not enhance household happiness by promoting saving behavior. The total effect of DFI on household happiness is 0.107, with a direct effect of -0.1075 and an indirect effect of 0.0005 through saving behavior.

In other words, although DFI shows a slight positive total effect on household happiness, this effect is primarily counterbalanced by its direct negative influence, with only a minimal positive contribution through the saving behavior pathway. Saving is frequently perceived as a strategy to enhance security and ensure future stability; however, it can paradoxically reduce household happiness for several reasons: (i) excessive saving may lead to increased loneliness and social isolation, as individuals often sacrifice time with loved ones in favor of accumulating financial resources; (ii) the pressure of stringent austerity measures aimed at saving can lower the quality of life, increase stress levels, and ultimately reduce household happiness; and (iii) savings are susceptible to inflation, which erodes purchasing power over time, reducing the real value of savings despite the nominal increase. Finally, an overemphasis on saving can restrict opportunities for immediate gratification through spending, which is often linked to pleasure and satisfaction.

Table 7. Regression Results of the Mediating Effect of Saving Behaviors.

Variables	(1)	(2)	(3)
	Household happiness	Saving	Household happiness
Saving			-0.175***
			(0.0473)
DFI index	0.107***	0.000309	0.1074***
	(0.0174)	(0.00238)	(0.0174)
Hours	-0.00128	0.000481**	-0.00120
	(0.00137)	(0.000188)	(0.00137)
Overtime	0.00165	-0.000167	0.00162
	(0.00158)	(0.000216)	(0.00158)
Family size	-0.000619	-0.00447***	-0.00140
	(0.00444)	(0.000607)	(0.00444)
Age	-0.00787***	0.000102	-0.00786***
	(0.000627)	(8.58e-05)	(0.000627)
Aging	-0.216***	0.0261***	-0.212***
	(0.0203)	(0.00278)	(0.0204)
Younging	-0.0976**	-0.00226	-0.0980**
	(0.0413)	(0.00565)	(0.0413)
Male	-0.0415***	0.00839***	-0.0400***
	(0.0138)	(0.00189)	(0.0138)
Education	0.00805***	0.000321	0.00810***
	(0.00161)	(0.000221)	(0.00161)
Marriage	-0.185***	0.00625**	-0.184***
	(0.0182)	(0.00249)	(0.0182)
Health condition	-0.171***	0.00780***	-0.169***
	(0.00568)	(0.000778)	(0.00569)
Constant	2.967***	0.0106	2.969***
	(0.0700)	(0.00958)	(0.0700)
Observations	23,911	23,911	23,911
R-squared	0.063	0.018	0.064

Note: Standard errors in parentheses
*** p<0.01, ** p<0.05.

4.5. Robustness Test

4.5.1. Change the Measurement Method of the Dependent Variable

The DFI Index encompasses three key dimensions: usage depth, coverage breadth, and digitization level (Guo et al., 2020). Given its multidimensional nature, this study explores the specific effects of each dimension on household happiness.

It examines whether an increase in the coverage breadth of digital finance contributes to higher household happiness, whether the usage depth has an influence, or whether the level of financial digitalization plays a significant role. The findings, summarized in Table 8, reveal that DFI, as measured by its coverage breadth, usage depth, and digitization level, substantially enhances household happiness.

Table 8. Robustness test of changing the measurement method of the dependent variable.

Variables	(1)	(2)	(3)
	Household happiness	Household happiness	Household happiness
Coverage Breadth	0.133***		
	(0.0193)		
Usage Depth		0.0608***	
		(0.0119)	
Digitization Level			0.129***
			(0.0245)
Hours	-0.00130	-0.00120	-0.00122
	(0.00137)	(0.00137)	(0.00137)
Overtime	0.00166	0.00167	0.00163
	(0.00158)	(0.00158)	(0.00158)
Family size	-0.000751	-0.000720	-0.000741
	(0.00444)	(0.00444)	(0.00444)
Age	-0.00789***	-0.00780***	-0.00780***
	(0.000626)	(0.000627)	(0.000627)
Aging	-0.216***	-0.216***	-0.216***
	(0.0203)	(0.0203)	(0.0203)
Younging	-0.0967**	-0.0980**	-0.0986**
	(0.0413)	(0.0413)	(0.0413)
Male	-0.0414***	-0.0422***	-0.0418***
	(0.0138)	(0.0138)	(0.0138)
Education	0.00780***	0.00840***	0.00851***
	(0.00161)	(0.00161)	(0.00161)
Marriage	-0.185***	-0.185***	-0.185***
	(0.0182)	(0.0182)	(0.0182)
Health condition	-0.171***	-0.170***	-0.170***
	(0.00568)	(0.00568)	(0.00568)
Constant	2.911***	3.116***	2.795***
	(0.0720)	(0.0579)	(0.104)
Observations	23,911	23,911	23,911
R-squared	0.063	0.063	0.063

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05.

4.5.2. Eliminating Special Samples

In China, municipalities such as Beijing, Shanghai, Tianjin, and Chongqing often receive preferential policies that promote their economic development (Liu et al., 2023). These advantages can create a disparity that skews the results of various economic analyses. To enhance the generalizability of the research findings, this study excludes data from China's four direct-controlled municipalities: Beijing, Shanghai, Tianjin, and Chongqing. The aim is to minimize potential biases arising from their distinct characteristics. The analysis results, summarized in Table 9, display various statistical metrics that confirm the continued positive impact of DFI on the household happiness of individuals outside these major metropolitan regions.

Table 9. Robustness test of eliminating special samples.

Variables	(1)	(2)	(3)
	Household happiness	Household happiness	Household happiness
DFI index	0.0880***	0.158***	0.254***
	(0.0222)	(0.0217)	(0.0326)
Hours		-2.38e-05	-0.00143
		(0.00146)	(0.00146)
Overtime		0.00164	0.00126
		(0.00174)	(0.00173)
Family size		-0.00152	0.00198
		(0.00465)	(0.00465)
Age		-0.00776***	-0.00772***
		(0.000667)	(0.000665)
Aging		-0.234***	-0.230***
		(0.0220)	(0.0220)
Younging		-0.0878**	-0.0926**
		(0.0434)	(0.0433)
Male		-0.0479***	-0.0187
		(0.0150)	(0.0152)
Education		0.00801***	0.00211
		(0.00174)	(0.00182)
Marriage		-0.196***	-0.197***
		(0.0195)	(0.0194)
Health condition		-0.168***	-0.170***
		(0.00603)	(0.00602)
Constant	1.855***	2.807***	2.527***
	(0.0721)	(0.0829)	(0.137)
Observations	21,102	21,102	21,102
R-squared	0.001	0.064	0.071

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05.

4.5.3. Lagging the Core Explanatory Variables by One Period

To address endogeneity concerns, this study employs one-period lags of DFI as the independent variable for empirical analysis. Endogeneity can stem from issues such as omitted variable bias, measurement error, or reverse causality, making it essential to tackle these issues to ensure the robustness and validity of our findings.

Based on the methodology proposed by Liu et al. (2023), this study lagged the primary explanatory variables by one period to strengthen causal inference and mitigate potential biases that could affect the DFI-household happiness relationship. From Table 10, the one-period lagged DFI continues to have a significantly positive effect on household happiness.

Specifically, the data reveal a consistent trend: greater access to digital financial services and their utilization correlate with higher reported levels of household happiness. This finding aligns with benchmark regression outcomes documented in the literature, reinforcing existing theories that suggest enhanced financial capabilities, facilitated by technology, positively impact subjective well-being.

Table 10. Robustness test of lagging the core explanatory variables by one period.

Variables	(1)	(2)	(3)
	Model 1	Model 2	Model 3
	Household happiness	Household happiness	Household happiness
2020 DFI index	0.142***	0.154***	0.138***
	(0.0208)	(0.0209)	(0.0208)
Borrowing		0.338***	
		(0.0385)	
Spending		0.00958	
		(0.0299)	
Investing		0.0134***	
		(0.00518)	
Saving		-0.154***	
		(0.0525)	
Hours	-2.81e-05	0.000376	-6.11e-05
	(0.00146)	(0.00145)	(0.00146)
Overtime	0.00165	0.00123	0.00142
	(0.00174)	(0.00174)	(0.00174)
Family size	-0.00154	-0.00430	-0.00180
	(0.00465)	(0.00465)	(0.00465)
Age	-0.00775***	-0.00670***	-0.00755***
	(0.000667)	(0.000677)	(0.000669)
Aging	-0.234***	-0.228***	-0.235***
	(0.0220)	(0.0220)	(0.0220)
Younging	-0.0885**	-0.0960**	-0.0888**
	(0.0434)	(0.0433)	(0.0434)
Male	-0.0478***	-0.0455***	-0.0455***
	(0.0150)	(0.0150)	(0.0151)
Education	0.00807***	0.00755***	0.00602***
	(0.00174)	(0.00178)	(0.00182)
Marriage	-0.196***	-0.191***	-0.196***
	(0.0195)	(0.0194)	(0.0195)
Health condition	-0.168***	-0.162***	-0.169***
	(0.00603)	(0.00608)	(0.00604)
FI			0.0114***
			(0.00311)
Constant	2.835***	2.687***	2.836***
	(0.0834)	(0.0865)	(0.0834)
Observations	21,102	21,102	21,102
R-squared	0.064	0.068	0.064

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05.

4.6. Heterogeneity Analysis

4.6.1. Rural–Urban Heterogeneity Analysis

The impact of China's DFI on household happiness exhibits rural-urban differences. From Table 11, the regression coefficients for DFI in both urban and rural areas are significantly positive, indicating that the development of DFI has significantly promoted household happiness in both areas. Notably, the effect of DFI on household happiness appears to be consistent across urban and rural areas. However, the strength of the spillover effect is stronger in urban areas compared to rural areas.

Table 11. Rural–urban heterogeneity analysis.

Variables	(1) Rural	(2) Urban
	Household happiness	Household happiness
DFI index	0.0464**	0.188***
	(0.0201)	(0.0312)
Hours	-0.00421**	0.000240
	(0.00171)	(0.00241)
Overtime	0.00451***	-0.00771**
	(0.00167)	(0.00327)
Family size	0.00364	-0.00619
	(0.00599)	(0.00694)
Age	-0.00642***	-0.0114***
	(0.000805)	(0.00109)
Aging	-0.235***	-0.171***
	(0.0268)	(0.0312)
Younging	-0.0720	-0.123*
	(0.0520)	(0.0699)
Male	-0.0148	-0.0231
	(0.0165)	(0.0280)
Education	0.00327	0.00314
	(0.00206)	(0.00311)
Marriage	-0.224***	-0.130***
	(0.0246)	(0.0323)
Health condition	-0.187***	-0.158***
	(0.00803)	(0.00917)
Constant	3.251***	2.779***
	(0.0881)	(0.124)
Observations	14,259	9,652
R-squared	0.066	0.061

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

4.6.2. Regional Heterogeneity Analysis

Due to variations in economic development and financial inclusion levels across different regions, the impact of digital financial inclusion (DFI) on household happiness may vary accordingly. Table 12 presents the estimated results for different regions. At the regional level, the direct effect coefficients of DFI on household happiness for the eastern and western regions are 0.199 and 0.287, respectively, both statistically significant ($p < 0.01$). The regression analysis reveals significantly positive coefficients for DFI in both the eastern and western regions, indicating that advancements in DFI have substantially enhanced household happiness in these areas. However, no such effect is observed in the central and northeastern regions.

Table 12. Regional heterogeneity analysis.

Variables	(1) East Regions	(2) Central Regions	(3) West Regions	(4) Northeast Regions
	Household happiness	Household happiness	Household happiness	Household happiness
DFI index	0.199***	0.0916	0.287***	-0.161
	(0.0270)	(0.0947)	(0.0709)	(0.209)
Hours	-0.00309	0.00306	-0.00294	0.00320
	(0.00219)	(0.00301)	(0.00248)	(0.00487)
Overtime	0.00407*	-0.00327	0.00251	0.000740
	(0.00219)	(0.00353)	(0.00266)	(0.00529)
Family size	0.00839	-0.0158*	0.000688	-0.0168
	(0.00733)	(0.00915)	(0.00793)	(0.0181)
Age	-0.00577***	-0.0115***	-0.00813***	-0.00693***
	(0.00102)	(0.00143)	(0.00113)	(0.00238)
Aging	-0.206***	-0.194***	-0.283***	-0.154**
	(0.0311)	(0.0430)	(0.0403)	(0.0672)
Younging	-0.0728	-0.113	-0.131*	0.165
	(0.0695)	(0.0882)	(0.0697)	(0.165)
Male	-0.00881	-0.0713**	-0.0555**	-0.0258

Variables	(1) East Regions	(2) Central Regions	(3) West Regions	(4) Northeast Regions
	Household happiness	Household happiness	Household happiness	Household happiness
	(0.0219)	(0.0302)	(0.0267)	(0.0474)
Education	0.00304	0.0110***	0.0113***	0.0115*
	(0.00251)	(0.00362)	(0.00299)	(0.00639)
Marriage	-0.187***	-0.172***	-0.167***	-0.256***
	(0.0316)	(0.0409)	(0.0355)	(0.0673)
Health condition	-0.176***	-0.168***	-0.164***	-0.175***
	(0.00978)	(0.0125)	(0.0113)	(0.0197)
Constant	2.518***	3.230***	2.419***	3.770***
	(0.122)	(0.328)	(0.231)	(0.640)
Observations	9,389	5,425	7,049	2,048
R-squared	0.061	0.075	0.067	0.068

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

4.6.3. Heterogeneity of City Scale

Cities exhibit considerable variation due to factors such as economic development, resource endowments, wealth levels, and demographic characteristics. Following the categorization proposed by Xie et al. (2019), this study classifies Chinese cities into three groups: large, medium, and small cities. Specifically, cities with a population of fewer than 500,000 are classified as small cities, those between 500,000 and 1 million as medium-sized cities, and cities with populations exceeding 1 million are considered large cities. To explore whether the impact of DFI on household happiness varies by city size, the sample is divided into these three categories for further analysis. Table 13 presents the estimated results for cities of different sizes. The findings indicate that the impact of DFI on household happiness shows heterogeneity across city scales. For example, the direct effect coefficients of DFI on household happiness are 0.129 for small cities and 0.0962 for medium-sized cities, both statistically significant at the $p < 0.01$ level.

Table 13. Heterogeneity of city scale.

Variables	(1) Large-scale Cities	(2) Medium-scale Cities	(3) Small-scale Cities
	Household happiness	Household happiness	Household happiness
DFI index	0.0130	0.129***	0.0962***
	(0.0316)	(0.0416)	(0.0317)
Hours	-0.00851***	0.00321	0.000594
	(0.00279)	(0.00342)	(0.00179)
Overtime	0.00546**	0.00525	-0.00118
	(0.00249)	(0.00394)	(0.00210)
Family size	-0.00898	-0.00412	0.00286
	(0.0100)	(0.0126)	(0.00550)
Age	-0.00647***	-0.00664***	-0.00904***
	(0.00123)	(0.00168)	(0.000845)
Aging	-0.196***	-0.169***	-0.243***
	(0.0384)	(0.0509)	(0.0270)
Younging	-0.0766	-0.0609	-0.116**
	(0.0836)	(0.110)	(0.0529)
Male	0.00278	-0.0355	-0.0600***
	(0.0242)	(0.0345)	(0.0201)
Education	0.0115***	0.00147	0.00793***
	(0.00318)	(0.00420)	(0.00220)
Marriage	-0.159***	-0.159***	-0.204***
	(0.0360)	(0.0502)	(0.0263)
Health condition	-0.194***	-0.181***	-0.164***
	(0.0125)	(0.0160)	(0.00769)
Constant	3.269***	2.917***	3.054***
	(0.138)	(0.188)	(0.115)
Observations	6,101	3,215	14,595
R-squared	0.068	0.063	0.064

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05.

4.6.4. Heterogeneity of Age

Table 14 presents the estimated outcomes for individuals across different age groups. The influence of DFI on household happiness in China varies significantly by age category. Specifically, the regression coefficients for DFI are significantly positive for individuals both before and after the 1970s. This suggests that the progress in DFI has notably improved household happiness in both of these age groups.

Table 14. Heterogeneity of age.

Variables	(1)	(2)
	Post-1970s	Pre-1970s
	Household happiness	Household happiness
DFI index	0.0516*	0.144***
	(0.0281)	(0.0211)
Hours	-0.00175	-0.00144
	(0.00197)	(0.00197)
Overtime	0.00276	0.00157
	(0.00181)	(0.00278)
Family size	-0.0244***	0.00381
	(0.00911)	(0.00621)
Age	-0.00120	-0.0100***
	(0.00153)	(0.00133)
Aging	-0.000936	-0.177***
	(0.0868)	(0.0268)
Younging	0.108*	-0.123*
	(0.0575)	(0.0726)
Male	-0.0157	-0.0669***
	(0.0217)	(0.0185)
Education	0.00237	0.0129***
	(0.00276)	(0.00206)
Marriage	-0.281***	-0.154***
	(0.0376)	(0.0241)
Health condition	-0.195***	-0.159***
	(0.0109)	(0.00730)
Constant	3.127***	2.870***
	(0.125)	(0.105)
Observations	8,769	15,142
R-squared	0.057	0.062

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

5. DISCUSSION

In alignment with prior studies, this research confirms a robust and positive relationship between DFI and household happiness (Yan, Tao, & Ullah, 2023; Zhao et al., 2024). The research findings suggest that DFI exhibits a significant positive correlation with household happiness. Additionally, the study reveals that changes in the primary independent variables, such as the extent of digital finance coverage, the depth of digital finance penetration, and the level of DFI, do not affect the direction of the coefficients for these factors. This finding indicates that regardless of modifications in the measurement of the dependent variable, the lagging of core explanatory variables by one period, or the exclusion of specific samples, DFI consistently enhances household happiness. These results align with those obtained from the baseline regression analyses and confirm the robustness of these primary findings. The outcomes of this robustness test further substantiate these hypotheses.

This research reveals a significant FL-DFI relationship, indicating that effective financial education policies are crucial for overall well-being. Interestingly, while higher FL generally has a positive effect, it can occasionally have an adverse impact on financial status. Additionally, the study highlights that FL significantly moderates the DFI-household happiness relationship. Specifically, as FL increases, the positive impact of DFI on household happiness tends to diminish.

This study contributes to existing research by examining how borrowing, spending, investing, and saving behaviors mediate the link between digital financial inclusion (DFI) and household happiness. Borrowing behavior shows a significant mediating effect, but the coefficient is negative. This indicates that although DFI encourages borrowing, it may reduce happiness due to debt burdens and overspending, in line with Meng and Xiao (2023). Spending behavior, however, does not significantly mediate the relationship. The absence of correlation suggests that spending does not play an intermediary role in improving household happiness. This finding contrasts with Zhao et al. (2024), who found that mobile payments under digital finance increased happiness among disadvantaged groups. In contrast, investing behavior has a significant positive mediating effect. This suggests that DFI promotes household happiness by enabling greater investment opportunities that improve well-being. This result differs from Xu and Sun (2022), who argued that digital finance reduces happiness by increasing risky investment participation.

Furthermore, saving behavior significantly mediates the DFI-household happiness relationship, but with a negative sign. The coefficient for saving behavior is significant at the 1% level, indicating that DFI does not enhance household happiness through increased saving. Research has shown that individuals who donate money report higher household happiness compared to those who save for personal use, with positive choices often having more adverse effects than passive ones (Moche & Västfjäll, 2022). These findings align with the conclusions of Moche and Västfjäll (2022).

The effect of China's digital financial inclusion (DFI) on household happiness varies across city sizes. This variation reflects differences in economic development, infrastructure, and access to technology. In large metropolitan areas, where digital financial services are widespread and integrated into daily life, residents often benefit from increased convenience and empowerment. In smaller cities or rural areas, where these services are less developed, the positive effects are weaker. Additionally, the spillover impact of DFI is more pronounced among individuals born after the 1970s compared to earlier generations.

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

This research deeply explores how DFI influences household happiness in China. It contributes to life satisfaction and overall well-being while addressing the imbalance and inadequacy in financial services that are increasingly demanded by the public. The study seeks to fill existing research gaps by analyzing the effects of DFI on household happiness in China. It also offers insights into the mechanisms linking DFI with household happiness. With a focus on financial behaviors as mediating factors, this research deepens the existing understanding of the DFI-household happiness relationship. Additionally, it employs FL as a moderating variable in this relationship. This study draws several conclusions from the mediation and moderation analyses. DFI has a significant positive relationship with household happiness. By changing the measurement method for the dependent variable, lagging the core explanatory variables by one period, or eliminating special samples, DFI still significantly promotes household happiness. The examination of various DFI measurement approaches shows that the indices, such as coverage extent, usage depth, and digitization degree all significantly contribute to household happiness. This suggests that DFI has a positive impact on household happiness.

DFI exhibits a strong association with borrowing, spending, and investing activities. However, it does not show a significant relationship with saving behaviors. Borrowing behavior significantly mediates the DFI-household happiness relationship; interestingly, despite the statistical significance, the coefficient for borrowing behavior is negative. This suggests that increased borrowing due to DFI does not enhance household happiness. In contrast, spending behavior does not mediate this relationship. Specifically, there is no correlation between spending behavior and household happiness, indicating that spending does not serve as an intermediary factor in achieving household happiness. To summarize, while DFI positively impacts borrowing, spending, and investing, it does not significantly affect saving. Moreover, borrowing and saving behavior statistically mediate the DFI-household happiness

relationship; this mediation has a negative impact, implying that higher borrowing or saving levels do not contribute to greater household happiness. Spending behavior, on the other hand, plays no role in mediating this relationship or influencing household happiness.

The DFI-household happiness relationship is also significantly mediated by both investing behavior. Specifically, there is a strong positive correlation between DFI, investing behavior, and household happiness, suggesting that investing behavior acts as a partial mediator in enhancing household happiness. In other words, DFI contributes to greater household happiness by promoting active investing practices. In summary, DFI influences household happiness through two key mechanisms: encouraging more frequent investing to contribute to improved household happiness.

FL serves as a positive moderator in the DFI-household happiness relationship. FL levels significantly influence the DFI-household happiness relationship: as FL increases, the positive impact of DFI on household happiness becomes more pronounced. Consequently, enhancing FL can amplify the beneficial effects of DFI on household happiness. For vulnerable groups, such as low-income households and rural residents, FL facilitates the effective use of digital financial services compared to other demographics. The development of DFI has significantly promoted household happiness in both urban and rural areas, with the effect being stronger in urban regions. Additionally, the effect of DFI on household happiness in the eastern and western regions is significantly positive, indicating that DFI has significantly promoted household happiness in these regions. However, the effect of DFI on the household happiness of cities of large and medium-scale cities is positive but does not pass the significance test. This may be due to the more complete financial service systems in these cities, where the marginal effect of DFI may be relatively small.

This research makes significant contributions to both modeling and academic literature. In terms of modeling, it investigates the relationship between DFI and household happiness across diverse demographic groups using data from the 2019 CHFS. The study employs statistical methods to evaluate how various aspects of DFI influence household happiness and explores the mediating effects of borrowing, spending, investing, and saving behaviors. It offers evidence on how DFI impacts financial behaviors while accounting for the moderating role of FL. Furthermore, by examining the varying impacts among households with different characteristics, including those living in urban versus rural areas, across different regions, city sizes, and cohorts (pre-1970s versus post-1970s), the study offers valuable implications for policymakers and financial institutions to develop targeted strategies.

From a literary standpoint, this research fills a research gap. While financial inclusion has received considerable attention, existing literature often overlooks the micro-mechanisms and channels through which DFI impacts household happiness, particularly the influence of varying financial behaviors. By investigating these relationships, this study enhances our understanding of borrowing, spending, investing, and saving behaviors within the broader framework of DFI. It underscores the necessity of considering both financial literacy (FL) and actual financial behaviors in the advancement of DFI and overall household happiness. Furthermore, by advocating for a comprehensive approach to DFI, one that integrates FL with behavioral aspects, this study offers valuable implications for policymakers and financial institutions to develop strategies that prioritize household happiness.

6.2. Policy Implication

This research deepens our understanding of the factors that influence household happiness and explores the diverse effects of digital economy growth on daily lives, providing implications for policy development. It offers empirical evidence of how DFI shapes financial practices and uncovers a somewhat negative moderating role of FL in the DFI-household happiness relationship. The results suggest that policymakers and community organizations should prioritize the development of regional digital economies, as DFI has become a key determinant of quality of life, significantly affecting both local economic conditions and individual contentment.

Based on the research findings, this study proposes the following policy recommendations: (i) developing countries should implement effective measures to enhance the positive effects of DFI on public well-being while mitigating its negative consequences; (ii) it is essential to regulate the debt-to-asset ratio of households and prevent unsustainable growth of debt levels; and (iii) efforts should be made to enhance financial literacy, particularly in rural areas, through the dissemination of financial knowledge.

This study investigates the connection between DFI and household happiness in China, offering valuable insights for multiple stakeholders: (i) policymakers should craft targeted measures to foster DFI, considering factors such as urban versus rural residence, regional disparities, city size, and generational differences (i.e., households established before and after the 1970s); (ii) it is advisable to prioritize the advancement of DFI in rural and smaller urban regions; (iii) policymakers should actively encourage the uptake of digital financial services; and (iv) continued support for the development of DFI can enhance its positive impact, particularly in rural areas and lower-tier cities.

6.3. Limitations

This study has limitations: (i) the scope of the study is confined to China, and future research should broaden its geographical coverage to include other regions for a more comprehensive analysis; (ii) this study employs cross-sectional data. Future studies employing panel data would offer a dynamic perspective, allowing for a deeper understanding of how DFI influences household happiness over time; and (iii) limited by survey questions, this study only investigates four types of financial behaviors. There may be additional mediating and moderating variables that influence the DFI-household happiness relationship, which warrants further exploration in future research with more extensive data.

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