Research on the Impact of Digital Economy Participation on the Financial Asset Allocation of the Elderly

Zhong Xiu Luo

Big Data and Statistics School, Guizhou University of Finance and Economics

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***Abstract*—** *Against the backdrop of a deepening aging population in China, the elderly face significant challenges in terms of old-age security. The development of the digital economy presents new opportunities for optimizing their financial asset allocation; however, technological barriers and insufficient financial literacy remain major obstacles. Based on data from the 2019 China Household Finance Survey (CHFS), this paper systematically analyzes the impact of household digital economy participation on the financial asset allocation of the elderly. The empirical results indicate that the digital economy can significantly optimize the asset allocation structure of the elderly by enhancing financial literacy, increasing attention to financial information, and strengthening risk tolerance. This effect is more pronounced in urban households and business-owning households. Based on these findings, this paper proposes improving age-friendly digital infrastructure and financial education systems, as well as optimizing information services and product supply mechanisms, to effectively translate the benefits of the digital economy into tangible improvements in the well-being of the elderly.*

***Keywords*— Digital Economy; Elderly Population; Financial Asset Allocation.**

I. INTRODUCTION

With the increasing aging of China's population, the elderly population faces growing retirement risks. The issue of wealth management for the elderly has become increasingly prominent, and how to rationally allocate financial assets to ensure the quality of life in old age has become an urgent social problem. Simultaneously, the elderly population generally faces significant challenges in financial asset allocation: on the one hand, deepening societal aging increases pension pressures, with insufficient pensions and rising medical costs making their financial management needs more urgent; on the other hand, limitations such as single income sources, insufficient financial knowledge, and narrow investment channels make it difficult for them to make rational investment decisions. Although financial markets offer opportunities for wealth appreciation, most households, especially the elderly, remain under-participants. In recent years, the rapid rise of the digital economy has profoundly changed the forms and content of financial services. The proliferation of technologies like internet finance, mobile payment, big data, and artificial intelligence has broken the spatiotemporal constraints of traditional financial services, providing new financial service platforms for the elderly. These emerging technologies make financial asset allocation more convenient and diverse, particularly as internet finance offers the elderly more direct, low-cost investment channels and wealth management tools. However, many elderly still face technological barriers and knowledge gaps in applying digital technologies and allocating financial assets, placing them at a disadvantage within the digital economy and preventing them from fully leveraging these technological advantages to optimize household financial asset allocation. Against the backdrop of an increasingly aging population, how to use the digital economy to promote optimized financial asset allocation and enhance the welfare of the elderly has become a pressing practical issue. Therefore, this paper focuses on analyzing the impact of household digital economy participation on the financial asset allocation of the elderly, explores its specific mechanisms, and proposes corresponding policy recommendations considering the challenges faced by the elderly. Based on the above analysis, this paper utilizes data from the 2019 national micro-household survey conducted by the China Household Finance Survey (CHFS) at Southwestern University of Finance and Economics to explore the impact of household digital economy participation on the financial asset allocation of the elderly. The

study finds that digital economy participation significantly optimizes the financial asset allocation of the elderly. Mechanism analysis shows that digital economy participation primarily optimizes elderly financial asset allocation by enhancing attention to financial information, improving financial literacy, and increasing risk tolerance. Heterogeneity analysis results indicate that the optimizing effect of digital economy participation on household financial asset allocation is more pronounced in urban households and households engaged in business or industry. Further research finds that optimized financial asset allocation enhances the welfare level of the elderly. The marginal contributions of this paper are as follows: First, it examines the specific impact of household digital economy participation on the financial asset allocation of the elderly from a micro perspective. Existing literature on the impact of the digital economy on financial asset allocation mostly focuses on prefecture-level city digital economy indices. Second, it enriches the research framework on the digital economy and household financial asset allocation. By focusing on the unique needs of the elderly in the digital economy environment, this paper provides targeted suggestions for policymakers aimed at promoting financial inclusion for the elderly and enhancing the effectiveness of their asset allocation. This offers a new perspective for research on the digital economy and household financial asset allocation. Third, it explores the impact of financial asset allocation on the welfare level of the elderly. By analyzing the effect of digital economy participation on the financial asset allocation of the elderly, this paper further examines how optimized asset allocation enhances their welfare level.

II. LITERATURE REVIEW AND THEORETICAL ANALYSIS

2.1 Literature Review:

The rapid development of the digital economy has become an important force driving economic transformation. With the widespread application of big data, cloud computing, artificial intelligence, and mobile internet technologies, the digital economy has penetrated deeply into various industries. Particularly in the financial sector, the digital economy provides strong support for the innovation and popularization of financial services (Wu Yu et al., 2021). The digital economy not only improves the efficiency of financial services but also reduces transaction costs in the traditional financial system through innovative business models, enhancing the accessibility and convenience of financial services (Zhang Lingshuang et al., 2023).Financial asset allocation is a core issue in household financial decision-making, involving the rational distribution of household assets across different financial products to achieve an optimal balance between risk and return. When allocating financial assets, households are influenced not only by wealth level and income sources but also closely related to financial knowledge and literacy (He Zongyue et al., 2020). For instance, households with higher financial literacy are typically able to make more rational choices among various investment products (Zhou Guangsu and Liang Qi, 2018). Furthermore, factors such as financial market accessibility, information asymmetry, and household risk attitude also significantly impact the efficiency and effectiveness of asset allocation (Wei Xianhua et al., 2014). With the continuous development of fintech and digital finance, household asset allocation strategies have become more flexible and diverse, a trend particularly evident among highly educated and high-income households (Wang Xiaohua et al., 2023). The impact of the digital economy on household financial asset allocation is gradually increasing. The application of digital technology not only enhances households' ability to access financial product information but also reduces the time and transaction costs associated with financial decisions, thereby improving the efficiency of household investment decisions (Wu Yu et al., 2021). Especially driven by digital inclusive finance and fintech, households can not only easily access various financial products but also configure them personally according to their needs, optimizing their risky asset portfolios (Zhang Xun et al., 2020). The widespread application of the digital economy has improved the accessibility of household financial services. Particularly with the promotion of fintech, financial participation among low-income households and in rural areas has significantly increased (Peng Yanling et al., 2022). However, some studies also point out that the digital divide and information asymmetry may negatively affect the elderly population, as their participation in the digital economy is relatively low, potentially limiting the effectiveness of their financial asset allocation (Zhu Wenpei and Lin Yi, 2024).Existing research primarily focuses on the impact of the digital economy on financial asset allocation at the prefecture-level city level, with few studies exploring the specific effect of household digital economy participation on the financial asset allocation of the elderly from a micro, household perspective. Especially considering the unique needs of the elderly in the digital economy environment, relevant literature is relatively scarce, lacking in-depth analysis of the effectiveness of their financial asset allocation and the improvement of their welfare levels. Therefore, this paper will explore the relationship between household digital economy participation and the financial asset allocation of the elderly from three aspects: the overall impact, the

mechanisms of impact, and heterogeneous effects, and further analyze the impact of financial asset allocation on the welfare of the elderly.

2.2 Theoretical Analysis and Research Hypotheses:

With the rapid development of the digital economy, the model of financial services has undergone significant changes, especially for household financial asset allocation, as the digital economy provides more flexible and diverse options. For the elderly, digital technology not only offers more opportunities to participate in financial markets but also promotes the transformation of their financial behaviors. However, how the digital economy affects the financial asset allocation of the elderly remains a question worthy of in-depth study. This research will focus on factors such as financial literacy, attention to information, and risk preference, and propose the following research hypotheses based on existing literature and theoretical frameworks. The rapid development of the digital economy has broken down the information barriers in traditional financial markets, making it easier for households, especially the elderly, to access information about financial products. According to information asymmetry theory, market participants usually face problems of asymmetric information acquisition, leading to decision-making biases and risks. However, with the popularity of digital platforms, the elderly can obtain detailed information about various financial products, market dynamics, and related investment analyses through the internet, thereby enhancing their market cognition and trust and optimizing their asset allocation decisions. Participation in the digital economy helps alleviate information asymmetry problems, lowers the threshold for information acquisition, and enables the elderly to make more rational and diversified asset allocation decisions based on more transparent and comprehensive market information (Zhang Lingshuang et al., 2023). Accordingly, the first hypothesis is proposed:

H1: Participation in the digital economy can optimize the financial asset allocation of the elderly. Information processing theory emphasizes that the quality of an individual's decisions is directly affected by the availability of information and their ability to process it. In the traditional financial system, the elderly often face difficulties in accessing information and have limited information channels. In the context of the digital economy, the volume of information has exploded. The elderly can easily access information about various financial products through digital platforms, including yield rates, risk analysis, and market trends. The increased availability and transparency of this information enable the elderly to understand the advantages and disadvantages of different financial products more comprehensively (Chen Nanxu et al., 2024). Therefore, the digital economy, by increasing the elderly's attention to financial information and enhancing their information processing capacity, prompts them to make more rational and scientific decisions in asset allocation. Furthermore, digital platforms can push personalized financial information and wealth management products based on the interests and needs of the elderly, further stimulating their interest and participation in financial markets, thereby optimizing their financial asset allocation (Zhou Li et al., 2024). Based on this, the second hypothesis is proposed:

H2: The digital economy optimizes the financial asset allocation of the elderly by enhancing their attention to financial information. Financial literacy theory holds that an individual's level of financial knowledge plays a crucial role in their investment decisions. Individuals with higher financial literacy are usually better able to understand the relationship between risk and return, and identify and avoid potential risks in investments. However, the elderly are generally relatively weak in financial literacy and lack systematic financial knowledge, making their asset allocation decisions susceptible to emotions or market noise, leading to decision-making errors. The rapid development of the digital economy, especially the popularization of online courses, videos, e-books, and investment tools, provides the elderly with more convenient ways to acquire financial knowledge. The elderly can learn about finance and improve their financial literacy at home or anywhere, effectively optimizing their asset allocation behavior, enabling them to make more rational and scientific decisions when facing complex financial markets (Yin Zhichao et al., 2015). The improvement in financial literacy allows the elderly to better understand the workings of financial markets, the risk characteristics of financial products, and financial strategies, thereby enhancing their judgment and decision-making ability in asset allocation (Wang Yake et al., 2024). Accordingly, the third hypothesis is proposed:

H3: The digital economy optimizes the financial asset allocation of the elderly by enhancing their financial literacy. According to risk preference theory, an individual's risk tolerance plays a vital role in their financial decisions. Especially when facing complex financial markets, individuals or households with higher risk preference tend to choose more diverse investment products and are willing to bear higher risks to achieve higher returns. In the context of the digital economy, if the elderly have

a higher risk preference, they may be more willing to participate in investments through digital platforms, particularly in higher-risk financial products such as stocks, funds, or other derivatives (Li Tao and Guo Jie, 2009). Digital platforms, by offering a rich selection of financial products and real-time market information, make it easier for the elderly to assess investment risks and make decisions. Therefore, this study proposes the fourth hypothesis:

H4: Risk preference plays a positive moderating role in the impact of the digital economy on the financial asset allocation of the elderly.

III. RESEARCH DESIGN

3.1 Data Description:

This study utilizes data from the 2019 China Household Finance Survey (CHFS). This annual survey covers 29 provinces (autonomous regions, and municipalities) in China, comprising detailed information from over 40,000 households, including basic demographic characteristics and asset allocation. Based on the research objectives, this paper focuses on the financial asset allocation behavior of elderly households. Therefore, the sample is restricted to households where the head of the household is aged 60 or above. After screening, a final valid sample of 9,408 households is obtained (2). Model Specification and Variable Design to test Hypothesis 1, that household digital economy participation can optimize the financial asset allocation of elderly households, and to eliminate regional differences between cities, a fixed effects model is used to estimate the impact of household digital economy participation on the financial asset allocation of the elderly. The baseline model is defined as follows:

$$Pensionfinance_i = \alpha_0 + \alpha_1 Dig_i + \alpha_2 X_i + \mu_i + \varepsilon_i \quad (1)$$

In Equation (1), Finance_i represents financial asset allocation,Dig_irepresents household digital economy participation,X_i is a vector of control variables, i denotes the household, c represents city fixed effects, and $\varepsilon_i$is the random error term.1. Dependent Variable: Financial Asset Allocation Following the approaches of Zhu Wenpei and Lin Yi (2022), Wang Xiaohua et al. (2023), and others, financial asset allocation is measured from the following three aspects:(1)Variety of Financial Assets: The CHFS questionnaire covers eight types of financial assets: deposits, stocks, funds, wealth management products, bonds, non-RMB assets, precious metals, and financial derivatives. For each type of financial asset, a value of 1 is assigned if the household holds that asset, otherwise 0. These values are then summed to obtain the total number of different types of financial assets held by the household (2). Scale of Financial Assets:This is represented by the natural logarithm of the total value of financial assets held by the household. Although financial asset scale strictly speaking does not fall within the scope of asset allocation, it reflects the overall level of household wealth and has a significant impact on the financial stability and consumption capacity of elderly households. In the context of the digital economy, an increase in the scale of financial assets provides the elderly with more investment opportunities and income sources, thereby indirectly influencing their asset allocation decisions. Thus, this indicator is included in the measurement of financial asset allocation in this paper (3). Diversification of Financial Assets: The degree of pension financial asset diversification is calculated using the asset diversification formula proposed by Shin et al. (2017): Diversification = , where's_j represents the proportion of the j-th financial asset in the total financial assets.

3.2 Core Explanatory Variable: Digital Economy Participation:

This study focuses on the micro-household level, examining the extent of household participation in the digital economy from the perspective of household actors, and constructs a household-level digital economy participation index. Drawing on the research approach of Zhao Tao et al. (2020), this paper selects five specific indicators for measurement: (1) Credit card usage, assigned a value of 0 or 1 based on whether the household uses credit cards; (2) Online shopping expenditure, measured as the logarithm of the total household online shopping expenditure in the previous year; (3) Communication expenses, represented by the logarithm of the household's annual communication expenditure; (4) Whether household members are employed in digital economy-related industries, with industry matching based on the Statistical Classification of the Digital Economy and Its Core Industries (2021)and assigned a value of 0 or 1; (5) Smartphone usage, assigned a value of 0 or 1 based on whether household members use smartphones. The specific composition of each indicator is shown in Table 1. On this basis, this paper employs factor analysis to synthesize the above indicators into a comprehensive index, aiming to reduce redundancy among the indicators and more comprehensively and accurately reflect the overall level of household participation in the digital economy.

TABLE 1
CONSTRUCTION OF THE DIGITAL ECONOMY INDICATOR SYSTEM

Primary Indicator	Secondary Indicator	Variable Description
Digital Economy Participation	Credit Card Usage	No = 0, Yes = 1
	Online Shopping Expenditure	Logarithm of last year's online shopping expenditure
	Communication Expenses	Logarithm of last year's communication expenses
	Employment in Digital Economy Industries	No household member employed in digital economy industries = 0, Yes = 1
	Smartphone Usage	Does not use smartphone = 0, Uses smartphone = 1

3.3 Control Variables:

To exclude other potential factors influencing financial asset allocation and improve the accuracy and reliability of the model estimation, this paper includes the following control variables: Household head characteristics include gender, age, education level, marital status, and health status. Household-level control variables include household registration type (hukou), household size, annual household income, and social insurance. By incorporating household head characteristics and household-level control variables, potential interference from individual and family background on financial asset allocation can be effectively controlled, thereby more accurately identifying the independent impact of digital economy participation on financial asset allocation. Variable definitions are shown in Table 2. Descriptive statistics are presented in Table 3.

TABLE 2
VARIABLE DEFINITIONS

Variable Type	Variable Name	Variable Description
Explained Variables	Types of Financial Assets	Number of types among the following financial assets held: deposits, stocks, funds, financial wealth management products, bonds, financial derivatives, non-RMB assets, internet wealth management products, precious metals (one or more)
	Scale of Financial Assets	Logarithm of the total value of household financial assets held
	Financial Asset Diversification	Degree of financial asset diversification calculated according to Equation (1)
Explanatory Variable	Digital Economy Participation	Measured by factor analysis
Control Variables	Age	Age in years
	Marital Status	Unmarried = 0, Married = 1
	Gender	Male = 1, Female = 0
	Education Level	No schooling = 1, Primary school = 2, Junior high school = 3, Senior high school = 4, Vocational/technical high school = 5, College/associate degree = 6, Bachelor's degree = 7, Master's degree = 7, Doctoral degree = 8
	Health Status	Very poor - Very good (1-5)
	Household Registration Type (Hukou)	Rural = 1, Urban = 0
	Household Size	Total number of household members
	Annual Household Income	Logarithm of annual household income
	Social Insurance	Has social insurance = 1, Does not have = 0

TABLE 3
DESCRIPTIVE STATISTICS

Variable	Observations	Mean	Std. Dev.	Min	Max
Types of Financial Assets	9408	1.266	0.886	0	7
Scale of Financial Assets	9408	11.839	2.831	0	16.695
Financial Asset Diversification	9408	0.725	0.425	0	1
Digital Economy Participation	9408	0.318	0.187	0	1
Average Digital Economy Participation in Same Community	9408	0.318	0.101	0	1
Age	9408	68.386	6.553	60	95
Marital Status	9408	0.807	0.395	0	1
Gender	9408	0.727	0.446	0	1
Education Level	9408	3.004	1.442	1	9
Health Status	9408	3.085	0.992	1	5
Household Registration Type (Hukou)	9408	0.345	0.475	0	1
Household Size	9408	2.487	1.392	1	15
Annual Household Income	9408	10.312	1.35	0.693	14.509
Social Insurance	9408	0.632	0.482	0	1
Risk Preference	9408	1.409	0.857	1	5
Financial Information Attention	9408	1.761	1.039	1	5
Financial Literacy	9408	0	1	-0.519	5.306
Engaged in Industry/Commerce	9408	0.045	0.208	0	1
City Classification	9408	2.171	0.898	1	3

3.4 Instrumental Variable:

Although the model controls for city fixed effects to avoid omitted variable issues at the city level, the factors influencing the financial asset allocation decisions of the elderly are complex and difficult to fully control for in the model. There may be other unobservable factors that simultaneously affect digital economy participation and financial asset allocation, i.e., an omitted variable problem. Furthermore, this study may also face a bidirectional causality issue, which refers to the possibility that households with higher levels of financial asset allocation may participate more actively in digital economic activities. To address these two endogeneity problems, and referencing the approaches of Zhu Jingjing (2024) and Wang Chen et al. (2025), the average level of digital economy participation of other households in the same community is used as an instrumental variable. On one hand, this community environmental characteristic is correlated with the individual household's participation level; on the other hand, it is independent of the specific household's financial asset allocation decisions, satisfying the relevance and exogeneity requirements of an instrumental variable.

IV. EMPIRICAL RESULTS AND ANALYSIS

4.1 Benchmark Regression Results and Analysis:

To test the robustness of the research findings, this paper employs a stepwise regression method to examine the relationship between household digital economy participation and the financial asset allocation of the elderly. The benchmark regression results (Table 4) show that household digital economy participation has a significant positive impact on the financial asset allocation of the elderly. After including all control variables and controlling for city fixed effects, the regression coefficients for digital economy participation on the types, scale, and diversification of financial assets are 1.132, 1.642, and 0.209, respectively, all significant at the 1% level. This indicates that household participation in the digital economy helps increase the diversity and scale of financial asset allocation among the elderly and optimizes their asset structure, supporting Hypothesis 1. Regarding control variables, the coefficient for the household head's education level is significantly positive, suggesting that households with higher educational attainment possess stronger information identification and processing capabilities, which helps improve the efficiency of financial asset allocation. The health status of family members also has a positive impact on financial asset allocation. Furthermore, higher household income levels are associated with more optimized financial asset

allocation, reflecting that higher-income households exhibit greater diversification in their asset portfolios. This result is consistent with the findings of Chen Binkai and Li Tao (2011).

TABLE 4
BENCHMARK REGRESSION OF DIGITAL ECONOMY AND HOUSEHOLD FINANCIAL ASSET ALLOCATION

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification
	-1	-2	-3
Digital Economy Participation	1.342***	1.132***	3.584***
	-0.048	-0.057	-0.149
Age		0.005***	
		-0.001	
Gender		-0.040*	
		-0.021	
Education Level		0.081***	
		-0.007	
Marital Status		0.109***	
		-0.024	
Health Status		0.048***	
		-0.008	
Household Registration Type (Hukou)		0.017	
		-0.024	
Household Size		-0.042***	
		-0.007	
Annual Household Income		0.061***	
		-0.008	
Social Insurance		-0.025	
		-0.022	
Observations	9408	9408	9408
City Fixed Effects	Yes	Yes	Yes

4.2 Robustness Tests:

Following the benchmark regression analysis, to ensure the robustness and reliability of the results, this paper conducts a series of robustness tests, including replacing the measurement method of the explanatory variable, excluding extreme values, and changing the econometric model. These methods aim to verify the consistency of the regression results under different data processing and model specifications. Through these tests, the interference of outliers can be eliminated, ensuring the stability of conclusions under various circumstances and enhancing the reliability of the results. 1. Replacing the Measurement Method of the Explanatory Variable To examine whether the benchmark regression results are affected by the variable measurement method, this paper further reconstructs the household digital economy participation index using the entropy method for robustness testing. The regression results in Table 5 show that after replacing the measurement method of the core explanatory variable, household digital economy participation still has a significant positive impact on the types, scale, and diversification of financial assets at the 1% significance level. This is consistent with the benchmark regression conclusions, indicating that the research findings of this paper are robust.

TABLE 5
REPLACING THE MEASUREMENT METHOD OF THE EXPLANATORY VARIABLE

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification
Digital Economy Participation	0.052***	0.081***	0.011***
	-0.003	-0.01	-0.002
Control Variables	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes
Observations	9408	9408	9408

4.3 Changing the Econometric Model:

To ensure the reliability of the conclusions, this paper replaces the OLS model with the Double Machine Learning (DML) model to test the robustness of the benchmark regression results. Compared with traditional regression methods, the DML model can effectively control biases caused by confounding variables and improve the accuracy and robustness of causal inference in scenarios with high-dimensional covariates or potential nonlinear relationships. Particularly when dealing with issues including multidimensional control variables, complex interaction terms, and uncertainty in variable selection, DML offers greater flexibility and estimation consistency. Therefore, selecting this method as a robustness test tool can more fully identify the actual impact of digital economy participation on the financial asset allocation of the elderly. The regression results (see Table 6) show that after changing the econometric model, the core coefficients remain significant and positive, further verifying the robustness of the conclusions in this paper.

TABLE 6
CHANGING THE ECONOMETRIC MODEL

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification
Digital Economy Participation	0.178***	0.260***	0.031***
	-0.013	-0.033	-0.006
Machine Learning Model	Random Forest	Random Forest	Random Forest
Control Variables	Yes	Yes	Yes
Observations	9408	9408	9408

4.4 Excluding the Influence of Extreme Values:

To avoid the influence of sample extreme values on the regression results, this paper applies a bilateral 5% winsorization to the original sample. The results, shown in Table 7, indicate that household digital economy participation significantly increases the scale, enriches the types, and enhances the diversification of financial assets, demonstrating the robustness of the regression results.

TABLE 7
EXCLUDING EXTREME VALUES

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification
Digital Economy Participation	0.199***	0.280***	0.038***
	-0.01	-0.033	-0.006
Control Variables	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes
Observations	9408	9408	9408

4.5 Instrumental Variable Model:

Table 8 reports the estimation results of the instrumental variable (IV) method. In the first-stage regression, the F-statistic of the instrumental variable is 656.460, far exceeding the common critical value, indicating no weak instrument problem. The Wald test is significant at the 1% level, further rejecting the null hypothesis of exogenous explanatory variables and confirming the validity of the instrument. After controlling for endogeneity, the marginal effects of digital economy participation on the types, scale, and diversification of financial assets are 7.935, 0.360, and 1.152, respectively, all significant at the 1% level, further confirming the robust positive effect of household digital economy participation on the financial asset allocation of the elderly.

TABLE 8
RESULTS OF THE INSTRUMENTAL VARIABLE MODEL

Variable	First-Stage Regression	Second-Stage Regression: Financial Asset Allocation
	Digital Economy Participation	Types of Financial Assets
Avg. Digital Econ. Participation in Same Community	0.222***	
	-0.016	
Digital Economy Participation		7.935***
		-1.229
Control Variables	Yes	Yes
City Fixed Effects	Yes	Yes
Observations	9408	9408
First-Stage F-statistic	656.46	
Wald Chi2 Test		1664.418
P-value		0

V. MECHANISM AND HETEROGENEITY ANALYSIS

5.1 Mechanism Analysis:

The research conclusions above indicate that household digital economy participation has a positive effect on optimizing the financial asset allocation of the elderly. Based on the theoretical analysis of the impact pathways of household digital economy participation presented earlier, this paper further empirically verifies its mechanism, exploring howhousehold digital economy participation optimizes the financial asset allocation of the elderly. Specifically, combining the two mediating variables proposed in the theoretical analysis—financial literacy and financial information attention—a mediation effect model is constructed for empirical testing to identify the impact pathways and transmission mechanisms of digital economy participation on the financial asset allocation of the elderly. 1. Financial Literacy Lusardi (2005) first proposed the measurement indicators for financial literacy, primarily involving three basic financial questions: compound interest, inflation, and risk diversification (measurement result is basic financial literacy). As financial products have become more complex, the measurement of financial literacy has been linked to investment portfolios. Rooij et al. (2011) expanded the measurement indicators for financial literacy, using questions related to stocks, funds, bonds, and insurance to measure respondents' advanced financial literacy. Therefore, this paper constructs a financial literacy index based on the following four questions from the CHFS questionnaire: (1) Interest: Assuming the bank's annual interest rate is 4%, if you deposit 100 yuan for a one-year term, what will be the principal and interest received after one year? (2) Inflation: Assuming the bank's annual interest rate is 5% and the annual inflation rate is 3%, after depositing 100 yuan in the bank for one year, will it be able to buy more, less, or the same amount of goods? (3) Stocks: In your opinion, generally speaking, which is riskier: main board stocks or growth enterprise board (ChiNext) stocks? (4) Funds: In your opinion, generally speaking, which is riskier: equity-oriented funds or bond-oriented funds? A correct answer is assigned a value of 1, otherwise 0, and factor analysis is used for measurement. Based on the analysis above, the mediation effect model is used to test the mediating mechanism of financial literacy on the financial asset allocation of the elderly. The specific results are shown in Table 9. According to column (1), digital economy participation is significant at the 1% level with a coefficient of 1.431, meaning household digital economy participation can significantly improve residents' financial literacy. Columns (2), (3), and (4) show the regression results after simultaneously introducing digital economy participation and financial literacy. It can

be seen that both digital economy participation and financial literacy have a significant positive impact on the types, scale, and diversification of financial assets, indicating that household digital economy participation can optimize the financial asset allocation of the elderly by enhancing residents' financial literacy.

TABLE 9
FINANCIAL LITERACY MECHANISM TEST

Variable	Financial Literacy	Financial Asset Allocation		
	-1	Types of Financial Assets (2)	Scale of Financial Assets (3)	Financial Asset Diversification (4)
Digital Economy Participation	1.431***	0.775***	1.413***	0.170***
	-0.068	-0.056	-0.181	-0.031
Financial Literacy		0.250***	0.160***	0.027***
		-0.008	-0.027	-0.005
Control Variables	Yes	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes	Yes
Observations	9408	9408	9408	9408

5.2 Financial Information Attention:

Access to financial information is a key channel for improving the efficiency of household financial asset allocation. The development of the digital economy not only provides convenient transaction platforms and improves financial market supply but also enhances households' attention to economic and financial information, thereby stimulating financial management demand, improving information acquisition efficiency, and ultimately optimizing asset allocation. To verify this transmission path, this paper constructs the "Financial Information Attention" variable based on the CHFS survey question, "How much attention do you usually pay to economic and financial information?" (scored 1-5). The regression results in Table 10 show that household digital economy participation significantly increases financial information attention. Furthermore, after controlling for this mediating variable, the coefficient for digital economy participation remains significantly positive, indicating that financial information attention plays a partial mediating role, thus supporting the hypothesis that household digital economy participation optimizes the financial asset allocation of the elderly by increasing their attention to financial information.

TABLE 10
FINANCIAL INFORMATION ATTENTION MECHANISM TEST

Variable	Financial Information Attention	Financial Asset Allocation		
	-1	Types of Financial Assets (2)	Scale of Financial Assets (3)	Financial Asset Diversification (4)
Digital Economy Participation	1.088***	0.996***	1.545***2	0.191***
	-0.072	-0.056	-0.179	-0.031
Financial Information Attention		0.125***	0.089***	0.017***
		-0.008	-0.026	-0.004
Control Variables	Yes	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes	Yes
Observations	9408	9408	9408	9408

5.3 Moderating Effect Test:

Risk preference is an important factor influencing household financial asset allocation (Guiso et al., 1996). Based on this, a dummy variable for risk preference is constructed using CHFS survey data, based on the question: "If you have a sum of money for investment, which of the following investment projects are you most willing to choose?" with 1-5 representing unwilling to take any risk to high risk. This section uses risk preference as a moderating variable to examine its moderating role in the impact of household digital economy participation on the financial asset allocation of the elderly. From column (1) of Table 11, the regression results for the types of financial assets show that the interaction term between digital economy participation and risk preference, as well as the coefficients for digital economy participation and risk preference, are all significantly positive at the 1% level. This means the higher the degree of risk preference, the stronger the promoting effect of digital economy participation on the types of financial assets held by the elderly, indicating that risk preference plays a positive moderating role in the process where household digital economy participation influences the financial asset allocation of the elderly. However, there is no significant moderating effect on the scale and diversification of financial assets.

TABLE 11
TEST OF THE MODERATING EFFECT OF RISK PREFERENCE

Variable	Financial Asset Allocation		
	Types of Financial Assets (1)	**Scale of Financial Assets (2)**	**Financial Asset Diversification (3)**
Digital Economy Participation * Risk Preference	0.251***	1.455***	0.178***
	-0.093	-0.292	-0.05
Digital Economy Participation	0.251***	1.455***	0.178***
	-0.093	-0.292	-0.05
Risk Preference	0.047**	0.028	0.021**
	-0.019	-0.061	-0.011
Control Variables	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes
Observations	9408	9408	9408

5.4 Heterogeneity Analysis:

To explore in depth the impact of digital economy participation on the financial asset allocation of the elderly in different types of households, this paper further conducts heterogeneity analysis by industry and urban-rural division. 1. Industry Heterogeneity The types of industries different households are engaged in may lead to differences in their asset allocation methods (Li Zibin et al., 2025), especially for households engaged in industry and commerce versus those not. Their economic structures, income sources, and risk preferences may differ significantly. Therefore, understanding the differential impact of digital economy participation in different types of households can help us more comprehensively understand the different mechanisms through which the digital economy affects household financial asset allocation. Based on this consideration, this paper classifies households by whether they are engaged in industry and commerce and conducts separate regression analyses for these two groups to explore the impact of digital economy participation on the financial asset allocation of different household types. Table 12 reports the heterogeneous regression results for households engaged and not engaged in industry and commerce. The results show that the impact of digital economy participation on financial asset allocation is more significant for households engaged in industry and commerce. Specifically, regarding the types, scale, and diversification of financial assets, the impact coefficients are higher for households engaged in industry and commerce than for those not engaged, and the Hausman test results show significant coefficient differences.

TABLE 12
HETEROGENEITY TEST: ENGAGEMENT IN INDUSTRY

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification			
	Engaged	Not Engaged	Engaged	Not Engaged	Engaged	Not Engaged
Digital Economy	1.277***	1.168***	2.945***	1.623***	0.452***	0.217***
	-0.357	-0.059	-0.852	-0.185	-0.151	-0.032
Hausman Test	7.05**		14.71**		16.08**	
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	427	8981	427	8981	427	8981

5.5 Urban-Rural Heterogeneity:

Due to the limitations of the urban-rural dual structure, rural households face more significant information asymmetry and resource constraints compared to urban households (Wang Wenbin and Wei Pengfei, 2025). On one hand, the construction of digital economy infrastructure in rural areas lags, restricting the channels for the elderly to access financial information and participate in the digital economy. On the other hand, the elderly in rural areas are at a more significant disadvantage in terms of digital literacy and financial knowledge, making them more prone to inefficient financial asset allocation. Analyzing urban-rural heterogeneity can more clearly reveal the differential impact of digital economy participation on the financial asset allocation of the elderly in different environments. Therefore, this paper divides households into urban and rural households for regression analysis to examine the different impacts of digital economy participation on the financial asset allocation of urban and rural households. Table 13 reports the regression results for urban-rural heterogeneity. The results show that the impact of digital economy participation on financial asset allocation is significantly higher for urban households than for rural households. Specifically, regarding the types and scale of financial assets, the impact coefficients for urban households are greater than those for rural households, and the Hausman test results show significant coefficient differences. This indicates that the optimization effect of digital economy participation on household financial asset allocation is more pronounced for urban households.

TABLE 13
URBAN-RURAL HETEROGENEITY TEST

Variable	Types of Financial Assets	Scale of Financial Assets	Financial Asset Diversification			
	Rural	Urban	Rural	Urban	Rural	Urban
Digital Economy	0.470***	1.386***	2.097***	2.109***	0.193***	0.185***
	-0.085	-0.072	-0.321	-0.217	-0.061	-0.034
Hausman Test	406.24***		89.97***		51.38***	
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3247	6161	3247	6161	3247	6161

5.6 Analysis of the Impact of Financial:

Asset Allocation on the Welfare of the Elderly The goal of optimizing financial asset allocation is to reduce risk and achieve stable wealth growth through scientific and rational asset distribution and effective investment management, thereby providing reliable financial security for the elderly, improving their quality of life and overall welfare, and giving the elderly greater economic autonomy and satisfaction. This paper considers both objective and subjective welfare, using household daily consumption expenditure to measure objective welfare levels and happiness to measure subjective welfare conditions. It further empirically examines the actual impact of financial asset allocation on the welfare of the elderly. 1. Impact of Financial Asset Allocation on Daily Consumption Expenditure of the Elderly With participation in the digital economy, the optimization of financial asset allocation for the elderly brings more investment income, thereby increasing their disposable income. Optimized

financial asset allocation enables the elderly to manage their income more flexibly, thus increasing daily consumption expenditure. To further explore the impact of financial asset allocation on the daily consumption expenditure of the elderly, this paper uses CHFS survey data to construct a variable for household daily consumption expenditure. The question, "Last year, how much was your household's average monthly food expenses, including purchases of grain, oil, meat, fruits, vegetables, (baby) formula, snacks, dining out, and takeout expenses?" is used as the measure, and its logarithm is analyzed to examine the impact of the types, scale, and diversification of financial assets on the daily consumption expenditure of the elderly. The results are shown in Table 14. The scale of financial assets has a significant positive impact on the daily consumption expenditure of elderly households. This indicates that having a larger scale of financial assets can increase income sources for elderly households, thereby enhancing their consumption capacity. The expansion of financial asset scale provides more financial support, allowing the elderly to incur higher daily consumption expenditure. However, the impact of financial asset diversification on consumption expenditure is not significant. This may be because, although diversification helps reduce risk, the slight returns from excessive diversification do not significantly change their consumption expenditure patterns.

TABLE 14
IMPACT OF FINANCIAL ASSET ALLOCATION OPTIMIZATION ON HOUSEHOLD DAILY CONSUMPTION EXPENDITURE

Variable	Household Daily Consumption Expenditure		
	-1	-2	-3
Types of Financial Assets	-0.009		
	-0.009		
Scale of Financial Assets		0.016***	
		-0.003	
Financial Asset Diversification			0.012
			-0.018
Control Variables	Yes	Yes	Yes
City Fixed Effects	Yes	Yes	Yes
Observations	9197	9197	9197

5.7 Impact of Financial Asset Allocation on the Happiness of the Elderly:

To further explore the impact of financial asset allocation on the happiness of the elderly, this paper adds the dimension of happiness based on the analysis of household daily consumption expenditure. Optimized financial asset allocation can enhance the elderly's confidence in the future by reducing economic pressure and improving economic independence, thereby increasing their subjective happiness. Therefore, this paper introduces a variable for happiness based on CHFS survey data, using the question, "Overall, how happy do you feel now?" with scores from 1 (very unhappy) to 5 (very happy). Combined with the types, scale, and diversification of financial assets, it explores how optimized financial asset allocation affects the happiness of the elderly. The results are shown in Table 15. Financial asset diversification has a significant positive effect on the happiness of the elderly, while the types of financial assets do not have a significant impact on happiness. A possible reason is that diversified investment, as a risk aversion strategy, can effectively reduce the volatility risk associated with a single asset, helping the elderly alleviate uncertainty about their future financial situation. Since the elderly have a stronger demand for economic security, diversified investment gives them more confidence to cope with future financial challenges, thereby enhancing happiness. In contrast, although the types of financial assets can increase income and consumption expenditure, their impact on happiness is not significant, possibly because the elderly focus more on stability and security in wealth accumulation and consumption rather than the expansion of asset types.

TABLE 15
IMPACT OF FINANCIAL ASSET ALLOCATION OPTIMIZATION ON THE HAPPINESS OF THE ELDERLY

Variable	Happiness		
	-1	-2	-3
Types of Financial Assets	0.016		
	-0.011		
Scale of Financial Assets		0.009**	
		-0.004	
Financial Asset Diversification			0.062***
			-0.02
City Fixed Effects	Controlled	Controlled	Controlled
Observations	9404	9404	9404

VI. CONCLUSIONS AND RECOMMENDATIONS

As China's population aging deepens, how to improve the wealth security level of the elderly population has become an important social issue that urgently needs to be addressed. Financial asset allocation, as a crucial means to achieve financial security and quality of life for the elderly, relates not only to the efficiency of family financial management but also directly affects the effectiveness of national policies in addressing pension risks. Against the backdrop of the rapid development of the digital economy, the deep integration of technological innovation and financial services provides new possibilities for improving the asset allocation efficiency of the elderly. However, given the practical challenges the elderly generally face, such as weak financial knowledge, high technical barriers, and limited information access channels, how to enable them to truly benefit from the digital economy has become the core issue of this study. Based on data from the 2019 China Household Finance Survey (CHFS), this paper focuses on the impact of household digital economy participation on the financial asset allocation of the elderly and systematically conducts empirical analysis. The study finds that household-level digital economy participation significantly optimizes the structure of financial asset allocation for the elderly, showing positive effects on the types, scale, and diversification of financial assets. Further mechanism analysis reveals that this impact is primarily achieved by enhancing the financial literacy and financial information attention of the elderly. Meanwhile, risk preference plays a positive moderating role, meaning that the elderly with higher risk tolerance are more likely to benefit from the digital economy. Additionally, heterogeneity analysis shows that this optimization effect is more pronounced in urban households and households engaged in industry and commerce. Further research also confirms the positive impact of optimized financial asset allocation on both the objective welfare (consumption expenditure) and subjective welfare (happiness) of the elderly. Based on the above findings, this paper proposes the following policy recommendations:

First, strengthen age-friendly digital infrastructure construction to bridge the urban-rural "digital divide." Increase investment in network and communication infrastructure in rural and underdeveloped areas, promote broadband access in rural areas, popularize smart devices, and implement user-friendly, age-appropriate adaptations for terminals. Simultaneously, establish digital service support windows in community service centers and village-level information stations to help the elderly access and use financial service platforms, narrowing the gap in digital participation between urban and rural areas.

Second, construct a multi-level system to enhance the financial literacy of the elderly, laying a solid foundation for investment awareness. It is recommended to promote multi-stakeholder cooperation (government, financial institutions, community organizations) with fiscal support to implement tiered and categorized financial education programs. Tailored training courses should be developed for the elderly with different education levels and information capabilities, covering topics such as risk identification, basic financial knowledge, and fraud prevention, to improve their investment judgment and rational decision-making abilities.

Third, improve the accessibility of financial information for the elderly to stimulate their willingness to pay attention to investments. Establish information dissemination channels that are closer to the elderly population. Encourage mainstream media to open "Senior Finance" columns, and financial platforms to launch age-friendly information sections, simplifying content and presenting operational processes visually. Promote a "one-stop" financial information acquisition and push mechanism, providing personalized, tiered, and clearly risk-indicated product information for elderly users, reducing cognitive costs, and

enhancing their willingness to invest. Fourth, enrich the system of financial products for the elderly that match their risk characteristics to achieve refined matching. The study finds that risk preference plays a moderating role between the digital economy and asset allocation. To guide the elderly with different risk preferences to allocate financial assets reasonably, it is recommended that financial institutions develop wealth management products categorized by risk level and provide customized asset allocation suggestions based on risk assessment results, helping the elderly achieve a balance between returns and security. Fifth, strengthen the effective conversion mechanism of digital economy achievements into the welfare of the elderly. The empirical results indicate that optimized financial asset allocation significantly improves the consumption capacity and happiness of the elderly. To promote the conversion of financial behavior into improved living standards for the elderly, relevant supporting mechanisms should be improved. For example, encouraging the allocation of part of the returns from digital financial products to health insurance, medical expenses, and life service consumption for the elderly, and promoting the integrated development of "finance + elderly care + health." At the same time, digital financial assistance policies for low-income elderly groups should be strengthened to achieve fair distribution of digital dividends.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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