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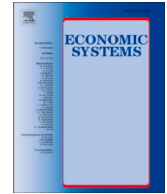
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Digital finance and stock market participation: The case of internet wealth management products in China

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ABSTRACT

Digital financing platforms have enhanced accessibility for households that wish to invest in wealth management products, but their impact on stock market participation remains underexplored in the literature. This paper investigates the effect of internet wealth management products on the household propensity to invest and participate in the stock market, using the microlevel dataset from the China Household Finance Survey, which covers 40,011 households. Our findings reveal that purchasing internet wealth management products positively and significantly influences the household inclination to invest and stock market participation level. Moreover, households with internet wealth management products have higher financial awareness and heightened interest in financial news. These characteristics not only reduce information costs but also promote stock market participation. Furthermore, the impact of purchasing internet wealth management products on stock market participation is more pronounced among households with higher education and lower income risk and residence in regions with a more developed financial market.

1. Introduction

The stock market participation puzzle refers to a social phenomenon in which the level of individual participation in the stock market is significantly lower than predicted by economic models, such as the capital asset pricing model (CAPM). This gap persists even with consideration of the risks associated with holding stocks (Bogan, 2008; Guiso and Jappelli, 2005; Mankiw and Zeldes, 1991; Vissing-Jorgensen, 2002). Over the past two decades, studies investigating the reasons for this puzzle have shifted their focus from general factors to the impact of technological innovation (e.g., Barber and Odean, 2002; Bogan, 2008; Choi et al., 2002).

The existing literature highlights transaction and information costs as the primary reasons for the low stock market participation rates (Christelis et al., 2010; Vissing-Jorgensen, 2004). Scholars contend that technological advancements can reduce these barriers and increase participation in the stock market. To illustrate, Bogan (2008) uses panel data from the United States in the 1990s to examine the impact of internet development on stock market participation. The study establishes that online stock trading and information availability is a causal factor in reducing transaction and information costs, thereby fostering more participation in the stock market. Bogan (2008: 209) confirms that online trading facilitates “lower transaction costs, lower information costs, and easier

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access to stock markets.” Other scholars investigate the origins and nature of these costs and analyze the correlation between financial awareness and limited participation in the financial market (Bazley et al., 2021; Guiso and Jappelli, 2005). For instance, Guiso and Jappelli (2005: 538) argue that the limited participation in the stock market stems from a “lack of awareness of the menu of available assets, such as stocks and mutual funds.”

Financial awareness refers to people’s ability to effectively manage financial resources in their personal life, using knowledge and skills acquired from various sources, including staying informed about financial news. By enhancing financial awareness, people can gain better control over their financial affairs and improve their overall standard of living (Bajo et al., 2015). At the individual level, people who have greater financial awareness are more likely to engage in future planning and make economically rational decisions regarding the purchase of property, savings, financial planning, and investment (Mishra, 2018). Therefore, financial awareness plays a pivotal role in building and maintaining personal wealth. On a broader scale, countries with a significant number of people and households that are financially aware have a higher level of wealth equality. Enhancement of financial awareness requires advancement in financial infrastructure, including the development of user-friendly digital financial platforms. These platforms can facilitate access to financial information, encourage financial education, and empower individuals to make informed financial decisions. Countries can contribute to their population’s overall well-being and economic stability by fostering financial awareness.

Over the past decade, wealth management products (WMPs) in China have emerged as a compelling investment option for individual investors, offered by banks and nonbank financial institutions. These products differ from traditional mutual funds in that they typically offer fixed returns and have shorter maturity periods. The returns from WMPs also tend to be considerably higher than those from regulated bank deposits (Perry and Weltewitz, 2015). As a result, these distinctive characteristics make WMPs highly attractive and popular among individual investors in China (Wang et al., 2022). Internet-based WMPs, or internet WMPs, involve purchasing and selling WMPs through online platforms by major internet companies, leveraging digital financial technologies. Integrating the internet and WMPs enhances the efficiency of financial product transactions and reduces associated costs. On the one hand, the internet is an ideal platform in which WMP providers can widely and rapidly disseminate product information to potential investors. This enables investors to access information about WMPs and conveniently purchase them at any time and from anywhere using their digital devices (Choi et al., 2002).

The internet has significantly changed the traditional multilayer agency model of WMPs, particularly with the emergence of internet WMPs. By leveraging digital platforms, internet WMP providers can bypass intermediaries and raise funds directly from individual investors (Ye and Chen, 2021). For instance, Yu’e Bao, a well-known internet WMP provider in China, attracts funds from users of Alipay (a mobile payment platform) and invests them in low-risk money markets. These convenient and low-risk WMPs offered by innovative digital finance platforms have encouraged individuals and households to purchase financial products, enabling them to accumulate investment experience and enhance their financial awareness.

The existing literature focuses primarily on general issues related to stock market participation, with only a few studies that explore the relationship between the internet and stock market participation (e.g., Bogan, 2008). Consequently, there is a significant research gap concerning the impact of internet WMPs on financial awareness and subsequent stock market participation. Our paper fills this gap by investigating the effects of internet WMPs on stock market participation by households. We conduct our study using China as a case study because it has emerged as a leading player in internet WMPs. By examining the Chinese context, we generate findings that can serve as a reference for similar studies conducted in other countries.

Our paper has two main objectives. First, we empirically examine the effects of internet WMPs on household stock market participation. By analyzing relevant data and employing statistical methods, we establish a quantitative understanding of the relationship between internet WMPs and household stock market participation. Second, we identify the underlying mechanisms in which the purchase of internet WMPs influences household stock market participation. By delving into the factors and processes involved, we shed light on the channels through which internet WMPs affect individual decision-making regarding stock market participation.

We use the highly regarded China Household Finance Survey (CHFS) dataset (2015, 2017, and 2019). Our baseline regression and two additional regression models have found compelling evidence indicating that purchasing Internet-WMPs positively influences stock market participation. Furthermore, our examination of the underlying mechanism behind the impact of Internet-WMPs’ purchase on stock market participation reveals that households with a higher financial awareness tend to have greater stockholdings than their counterparts. Additionally, our heterogeneity analysis uncovers that the effect of Internet-WMPs’ purchase on stock market participation is particularly pronounced for households with higher educational qualifications, lower income risk, and those residing in regions with a more developed financial market. To address potential endogeneity concerns, we augment our analysis by performing instrumental variable (IV) regression, ensuring the robustness of our findings.

The study contributes to the existing literature in various ways. To the best of our knowledge, this study is the first to explore the relationship between the purchase of internet WMPs and stock market participation. By introducing this new perspective, we offer fresh insights into the ongoing debate surrounding the stock market participation puzzle, shedding light on how internet WMPs might solve this puzzle. Our study extends the discussion beyond the broader impact of digital finance on stock market participation, as previously examined by scholars such as Bogan (2008), and focuses specifically on the role of internet WMPs. The significance comes from the transaction convenience provided by digital finance and its potential for enhancing financial awareness. By highlighting the impact of internet WMPs on financial awareness, our findings contribute to better understanding of the channels through which financial investment awareness can spread. These insights have valuable policy implications for the Chinese government and other emerging economies, which we discuss in detail. Our study offers empirical evidence that confirms the mediating factors that explain the relationship between investment in internet WMPs and stock market participation. By establishing these mediating factors, we highlight the importance of financial awareness in driving stock market participation. This fresh empirical evidence adds to the

existing body of literature and strengthens understanding of the underlying mechanisms that link internet WMPs and stock market engagement.

The remaining sections are organized as follows. Section 2 provides an overview of the development and advancement of internet WMPs in China, including the theoretical reasoning. Section 3 presents a detailed description of the data used in the study. Section 4 discusses the empirical results of our analysis. Section 5 concludes by summarizing the main findings and their implications.

2. Institutional background and theoretical analysis

2.1. Institutional background

2.1.1. WMPs

A wealth management product (WMP) is a short-term investment vehicle that derives cash flows from a dedicated investment pool. In China, WMPs were first introduced in 2005, after banking sector reforms at state-owned banks by the Chinese government, as part of its effort to expand the range of financial services available (Hachem and Song, 2016). At first, WMPs were primarily offered by state-owned banks, but then in 2009 they became available at non-state-owned banks and other financial intermediaries, including trust companies, securities firms, and insurance companies. This expansion was driven by a strong motivation to capitalize on the opportunities introduced by loosening in the regulatory environment that was previously prevalent as part of a contractionary monetary policy from 2003 (Luo et al., 2019). This development in the Chinese financial landscape reflects growing diversification in the providers of WMPs, enabling broader access to these investment products beyond traditional state-owned banks. These changes have played a significant role in shaping the availability and popularity of WMPs in China.

In China, commercial banks and other financial intermediaries have both shown a strong preference for WMPs, mostly because WMPs are off-balance-sheet investment products that can substitute for traditional deposits, allowing financial institutions to avoid regulatory interest rate ceilings, such as the 75% loan-to-deposit enforcement i.e., banks only allow providing maximum 75% loan of the deposits received from savers; it also enables them to engage in regulatory arbitrage and compete more effectively in the market for bank deposits. The loose regulations surrounding WMPs have contributed to their popularity. Consequently, WMPs have become an integral part of shadow banking in China, as highlighted by Chen et al. (2018) and Acharya et al. (2021). Research evidence (Luo et al., 2019) also indicates that commercial banks in China employ innovative strategies to manage the maturity mismatch of their WMPs. By doing so, they reduce the ratio of nonperforming loans on their balance sheets, potentially mitigating risks associated with these off-balance-sheet investment products (Luo et al., 2019).

The emergence of WMPs has introduced new financial investment options for households and institutions, leading to a significant increase in purchases of them. According to Luo et al. (2019), in 2016 approximately 65% of WMP purchases were made by individuals and households, compared with 23% by institutions. The popularity of WMPs can be attributed primarily to their short-term maturity and low risk. For example, around 80% of WMPs have a maturity period of less than six months, and a substantial share (60%) mature in less than three months (Luo et al., 2019). Moreover, most WMP funds are invested in low-risk projects, such as bonds, bank deposits, interbank lending, nonstandard debt instruments, and money markets (Luo et al., 2019). Consequently, the risks associated with investing in WMPs are generally low, and, in some cases, these products even come with guarantees on both the principal and expected yield (Luo et al., 2019). From this perspective, it is apparent that WMPs are particularly suitable for less experienced investors with low risk tolerance.

However, despite the availability of WMPs, a significant share of the population, particularly low-income households, had no WMP investment until the rise of digital platforms, such as Alipay and internet-based WMPs for two primary reasons. First, traditional banks set investment thresholds of WMPs for individuals that are often too high, typically RMB 50,000–RMB 100,000. Consequently, many low-income households and individuals avoided WMP investment. Second, information asymmetry exists between banks and households/individuals, who thereby lack accurate information on the benefits and risks of investing in WMPs.

2.1.2. Digital finance and internet WMPs

China has gained recognition as a global leader in digital finance (Lu et al., 2021). The Chinese population has embraced the cashless society, with smartphones as the primary means of payment. Digital finance has become integral to the Chinese financial system (Zhao et al., 2022). As early as 2004, Alibaba, an e-commerce giant, introduced its third-party payment platform, Alipay. This platform bridged the gap between merchants and customers, providing a safe, convenient, and efficient e-payment system. The launching of Alipay enabled Alibaba to become the largest e-commerce platform in China. Initially, Alipay had limited functionality and did not collaborate with internet firms, commercial banks, and third-party payment systems. It had a small user base and faced little regulation (Zhao et al., 2022). However, in 2011, the People's Bank of China issued a third-party payment license to Alipay and similar platforms, laying the legal foundation for developing digital finance in China.

In 2013, the digital finance revolution in China underwent a significant transformation, as major internet companies, such as Alibaba, Baidu, and Tencent, expanded to the financial sector and introduced innovative online business models. These models enabled a redefinition of financial services, from the traditional bank-dominated and branch-based payment system to a new era of digital finance. That year also marked the introduction of Yu'E Bao, a financial product owned by Ant Financial, resulting from the collaboration between Alibaba and Tianhong Asset Management. Yu'E Bao offers fund management services, enabling individuals to transfer funds from their Alipay accounts to Yu'E Bao for investment in a money market fund, while retaining rights to withdraw money when they need. Yu'E Bao combines mobile payment and internet finance, becoming a robust platform for internet WMPs. In its inaugural year, 2013, Yu'E Bao attracted 81 million users and accumulated over RMB 540 billion in funds, propelling Tianhong

Asset Management to become the seventh-largest fund globally. By the end of 2017, the net asset value of Yu'E Bao had reached RMB 1.5798 trillion.

Yu'E Bao has three key characteristics that contribute to its popularity and appeal. First, it involves low risk and high returns. Yu'E Bao assets are considered risk-free, akin to bank deposits. It invests in a low-risk money market, and investors can exit any time. Moreover, the investment returns are significantly higher than the interest rates offered on bank deposits over the same period. For instance, in 2013, the highest annualized yield for seven days on Yu'E Bao exceeded 6%, while the interest rate on current account bank deposits was only 0.3%. Second, it has a low entry threshold for personal financing. Traditional banks typically require a minimum capital threshold (RMB 50,000–100,000) to access financial products and services. This often excludes many individuals and households who do not meet the qualification criteria or are unwilling to invest these amounts. However, Yu'E Bao offers a low entry threshold, just RMB 1 (equivalent to US\$0.16), enabling broad participation. Third, Yu'E Bao offers high convenience and high liquidity, just as with a bank's current account. Individuals and households can conveniently transfer money through mobile phone applications.

2.2. Theoretical reasoning

The rise of digital financial platforms has significantly expanded the availability of and accessibility to financial services, offering convenient investment channels to individuals worldwide (Ozili, 2018). Before the introduction of Yu'E Bao in China, average households had limited exposure to financial investment instruments, which led to a lack of knowledge and experience about them. However, the growth in internet WMPs has substantially expanded, empowering individuals to effectively manage their disposable income by purchasing user-friendly financial products and accumulating investment experience.

The acquisition of investment experience plays a crucial role in shaping individuals' financial awareness, encompassing their understanding of financial instruments, enhancement of investment capabilities, and increase in willingness to invest. Drawing on the classical “learning by doing theory” (Arrow, 1962; Grossman et al., 1977; as cited in Seru et al., 2010), accumulated investment experience signifies the learning process and outcomes derived from engaging in investment activities (referred to by Seru et al. (2010) as “learning by trading”). In general, households with limited investment experience tend to struggle with managing their financial portfolios (Hanna and Chen, 1997), whereas experienced investors demonstrate superior information processing and analytical ability (Guiso et al., 2003) and a keen interest in diversifying their portfolios by investing in various financial instruments (Calvet et al., 2007). In other words, households can enhance their investment capabilities through active participation in relevant investment opportunities, such as making simple investments on digital financial platforms (Feng and Seasholes, 2005; Nicolosi et al., 2009).

Furthermore, the accumulation of investment experience can influence investors' risk behavior. Individuals with limited financial knowledge and experience tend to be risk averse and reluctant to take risks, preferring to hold cash and bonds while being hesitant to invest in volatile financial assets, such as stocks (Grable and Lytton, 2003; Mishra, 2018). In contrast, seasoned investors have higher risk tolerance, often displaying confidence in their investment decisions (Chou et al., 2010; Roszkowski and Davey, 2010). They are more likely to actively participate in the stock market and allocate a larger portion of their portfolios to risky assets (Wood and Zaichkowsky, 2004).

Some investors discontinue their investment activities after they recognize their limited financial knowledge and inadequate investment skills (Seru et al., 2010).² However, this investment cessation effect is primarily observed in experiences characterized by poor performance. In the context of purchasing internet WMPs on digital financial platforms, the likelihood of investor withdrawal from trading is significantly low or minimized due to the inherent characteristics of internet WMPs discussed earlier: low investment risk and high returns. For example, in China before 2018, most internet WMPs offered principal guarantees, and the platforms (e.g., Yu'E Bao) ensured a certain level of return. As a result, most investors earned positive investment revenue, and internet WMPs were regarded as relatively risk-free investments (Acharya et al., 2021). Therefore, it is likely that average households could acquire investment experience with positive performance through their investment in internet WMPs.

Individuals who are financially aware tend to seek financial information proactively, often relying on sources such as financial news. Consequently, these people incur lower information costs when they participate in the stock market than individuals who pay less attention to financial information (Bonaparte and Kumar, 2013). Based on this premise, our central testable hypothesis is that households that invest in internet WMPs are more likely to have a higher propensity for participation in the stock market. Additionally, we anticipate that internet WMPs positively enhance financial awareness by households and individuals, fostering greater focus on financial news and information.

3. Methodology

3.1. Data

The main dataset used in this research comes from the three most recent versions of the China Household Finance Survey (CHFS), namely CHFS 2015, 2017, and 2019. The CHFS is a widely recognized and comprehensive survey conducted by the Research Center

² Seru et al. (2010) define this behavior as “learning about ability.”

for Chinese Household Finance at the Southwestern University of Finance and Economics. This survey gathers extensive and detailed information on various aspects of household finance, including assets, debt, expenditure, income, family structure, education, and other socioeconomic characteristics. Consequently, researchers in economics and finance have extensively relied on the CHFS in their studies (e.g., Liu et al., 2020; Zou and Deng, 2019). In this study, we focus on households that participated in all three rounds, resulting in a final sample size of 12,638 households, with 37,914 observations.

3.2. Variables

3.2.1. Stock market participation

Building on previous research (e.g., Giannetti and Wang, 2016; Malmendier and Nagel, 2011), this study measures stock market participation using two dependent variables: *Stock_own* is a binary variable that takes a value of one if a household holds stocks and zero otherwise; and *Stock_share* represents the ratio of stock holdings to total household assets.

To determine stock market participation, the survey poses specific questions related to stock ownership, chiefly: “Does your household currently own any stocks?” If the respondent answers “yes,” then we consider them to have stocks (i.e., *Stock_own* takes a value of one), and respondents are asked an additional question: “What is the total market value of all the stocks held by your household?” Then, we divide the total market value of stocks by the total household assets in order to calculate *Stock_share*. However, because the initial value of *Stock_share* is very low, in the regression analysis, we multiply it by 100 to facilitate interpretation.

3.2.2. Internet WMPs

The main explanatory variable in this study is the purchase of internet WMPs. The CHFS survey defines internet WMPs as WMPs acquired through online platforms specifically designed for such products, such as Yu'E Bao and WeChat Coin Pass. To calculate this variable, the survey asks the respondents, “How much has your household invested in internet WMPs?”

To incorporate this information into our analysis, we introduce a binary variable called *Inter_dummy*, which takes a value of one for households that have purchased internet WMPs, and zero for households that have not purchased them. Additionally, we create another variable, *Inter_ratio*, for the ratio of the total value of internet WMPs to total household assets. As with *Stock_share*, the initial value of *Inter_ratio* tends to be relatively low, and we similarly multiply it by 100 in our regression analysis to facilitate meaningful interpretation and comparison.

3.2.3. Control variables

In the context of this study, various characteristics of households and household heads are used as control variables. These variables include total assets (*Assets*), total income (*Income*), the number of household members (*Number*), and the average number of years of education of all household members (*Education*). The control variables for household heads comprise their age (*Age*), gender (*Gender*), marital status (*Married*), affiliation with the Chinese Communist Party (*Party*), and whether they are self-employed (*Self_employed*). Table 1 lists the descriptive statistics for these variables, summarizing their characteristics and distribution within the sample.

Table 1 reveals that the participation rate of our sample households in the stock market is merely 5.4%, which aligns with previous studies conducted in China (e.g., Niu et al., 2020). This finding suggests that the propensity of households to engage in stock market activities is significantly lower in China than in countries with more developed financial markets. For instance, the stock market participation rate exceeds 20% in the UK (Guiso et al., 2008) and is around 49% in the US (Bonaparte and Kumar, 2013). Furthermore, the proportion of stock assets to total household assets in our sample is relatively low, only 0.173%. The ownership rate of internet WMPs by households is just 6.4%, and the ratio of internet WMPs to total assets is as low as 0.066%.

Table 1
Statistical Summary.

Variable	Mean	Std. dev.	Min.	Median	Max.
<i>Stock_own</i>	0.054	0.226	0	0	1.
<i>Stock_share</i>	0.173	1.094	0	0	9.789
<i>Inter_dummy</i>	0.064	0.245	0	0	1
<i>Inter_ratio</i>	0.066	0.414	0	0	3.808
<i>Assets/1000</i>	1068.17	1863.90	1.11	381.55	11,100
<i>Income/1000</i>	81.92	102.78	0	53.75	653.21
<i>Number</i>	3.404	1.612	1	3	8
<i>Education</i>	7.812	3.502	0	7.5	16
<i>Gender</i>	0.798	0.402	0	1	1
<i>Age</i>	55.86	12.88	24	56	85
<i>Married</i>	0.909	0.288	0	1	1
<i>Party</i>	0.176	0.381	0	0	1
<i>Self_employed</i>	0.088	0.283	0	0	1

3.3. Empirical models

We employ the following panel regression model to assess the influence of purchases of internet WMPs on household decisions regarding stock market participation:

$$Stockholding_{it} = \beta_0 + \beta_1 Internet - WMPs_{it} + \beta_2 X_{it} + Year_i + \rho_j + \mu_{it} \quad (1)$$

where i is a household, and t is a year. *Stockholding* measures household stock market participation, including *Stock_own* and *Stock_share*. *Internet WMPs* measure household purchases of internet WMPs, including *Inter_dummy* and *Inter_ratio*. X is a set of control variables. We also control for year (*Year*) and household fixed effects (ρ) in the regression, which can eliminate the influence of unobserved heterogeneity across years and households on our results. μ is the random disturbance term.

We employ the panel logit model to analyze the relationship between internet WMPs and stock market participation. This model is suitable for estimating the empirical model when the dependent variable is *Stock_own*. By using the panel logit model, we can consider the binary nature of the dependent variable and examine the influence of internet WMPs on stock market participation, controlling for other relevant factors. Furthermore, we use the fixed effects panel model to estimate the empirical model when the dependent variable is *Stock_share*. This model enables us to investigate the effect of internet WMPs on the proportion of a household's stock portfolio. By including internet WMPs as an independent variable, we can examine how it affects household allocation of its total assets to stocks. The fixed effects panel model considers unobserved heterogeneity across households by incorporating fixed effects for each household into the analysis. This helps mitigate potential biases arising from time-invariant household-specific factors.

4. Results

4.1. Baseline results

Table 2 presents the results of the baseline regression. In Columns (1)-(3), we report the findings of the panel logit model, which focuses on assessing the probability of stock market participation among households. Columns (4)-(6) display the results of the fixed effects panel model, which investigates the allocation of household stock assets.

Following Bertaut and Starr-McCluer (2001), Calvet et al. (2007), Kumar (2009), and Briggs et al. (2021), we divide the control variables into two groups to capture the characteristics of households and household heads. Previous research (for example, Guiso et al., 2003) suggests that households with higher levels of wealth, income, and educational attainment have a higher propensity to

Table 2
Internet WMPs and stock market participation.

	<i>Stock_own</i>			<i>Stock_share</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Inter_dummy</i>	2.200 *** (0.082)	1.745 *** (0.077)	1.711 *** (0.082)	0.345 *** (0.027)	0.332 *** (0.027)	0.328 *** (0.029)
Household characteristics						
<i>logAsset</i>		0.330 *** (0.024)	0.331 *** (0.025)		-0.024 *** (0.006)	-0.028 *** (0.007)
<i>logIncome</i>		0.147 *** (0.026)	0.147 *** (0.027)		0.007 (0.005)	0.008 (0.005)
<i>Number</i>		-0.171 *** (0.022)	-0.169 *** (0.024)		-0.013 * (0.007)	-0.011 (0.007)
<i>Education</i>		0.115 *** (0.010)	0.108 *** (0.011)		0.001 (0.004)	-0.003 (0.004)
Characteristics of household head						
<i>Gender</i>			-0.258 *** (0.070)			-0.027 (0.026)
<i>Age</i>			-0.042 ** (0.016)			-0.013 (0.010)
<i>Age2</i>			0.000 * * (0.000)			0.000 (0.000)
<i>Married</i>			0.228 * (0.119)			-0.055 * (0.032)
<i>Party</i>			0.172 * * (0.075)			0.055 (0.041)
<i>Self_employed</i>			-0.065 (0.100)			0.045 (0.033)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,814	36,981	34,071	37,823	36,990	34,080

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

hold stocks. Conversely, people who are self-employed are often considered less likely to participate in the stock market (Niu et al., 2020). By incorporating these control variables into our analysis, we account for the impact of these factors on the likelihood of household stock market participation and household allocation of assets to stocks.

In Columns (1)-(3) of Table 2 the estimated coefficients of internet WMPs are positive and statistically significant at the 1% level. These findings indicate that the purchase of internet WMPs is associated with a higher probability of household participation in stock market investment. We estimate the odds ratios in the panel logit models to interpret the economic implications further. For instance, in Column (3), the coefficient of internet WMPs is 1.711. This implies that households with internet WMPs are approximately 1.711 times more likely to participate in the stock market than those without internet WMPs, a significant difference. Moreover, when the average stock market participation probability is 5.4%, the effect of internet WMPs on household stock market participation becomes economically meaningful.

Likewise, in Columns (4)-(6) of Table 2, the estimated coefficients of internet WMPs are positive and statistically significant. This indicates that households with internet WMPs allocate more of their wealth to stocks. Furthermore, in Column (6), the marginal effect of internet WMPs is 0.328. This implies that households with internet WMPs experienced a 0.328% increase in the weight allocated to stocks in their portfolios. When the average stock share is 0.173%, the effect of internet WMPs on the portfolio share of stocks becomes economically meaningful. The estimated coefficient of 0.328 indicates that households with internet WMPs had a sizable increase in the allocation of stocks as a share of their overall wealth.

The estimation results obtained from our analysis provide robust support for our main conjecture that the purchase of internet WMPs significantly influences household decisions regarding stock market participation. The positive and statistically significant coefficients associated with internet WMPs in both the panel logit models and the fixed effects panel models indicate a strong and consistent effect. The results demonstrate the substantial impact of internet WMPs on shaping household investment choices and their willingness to engage in stock market activities.

4.2. Extended regression specifications

4.2.1. The ratio of internet WMPs

We expand on the baseline regression specifications to comprehensively analyze the connection between internet WMP purchases and stock market participation. In our first extension, we investigate the potential impact of the value of internet WMPs on stock market participation. To achieve this, we replace the variable indicating whether households possess internet WMPs (*Inter_dummy*) with the variable representing the ratio of internet WMPs (*Inter_ratio*) in our regression models.

Table 3 presents the results of our analysis, which uses the same regression framework as the baseline model. In all columns, the estimated coefficients of *Inter_ratio* are consistently positive and statistically significant at the 1% level, which indicates a significant relationship between a higher ratio of internet WMPs and the likelihood that households have stock assets. Furthermore, we calculate the odds ratios to offer additional insights. In Column (3), the estimated coefficient of *Inter_ratio* is 0.613, suggesting that for every one-unit increase in the internet WMPs ratio, the odds of stock market participation increase by 61.3%. In Column (6), the estimated coefficient of *Inter_ratio* is 0.175, indicating that a 1% increase in the internet WMPs ratio corresponds to a 0.175% increase in the weight allocated to stocks. These estimation results support our main hypothesis, providing robust evidence for the relationship between internet WMPs and stock market participation.

4.2.2. Instrumental Variable (IV) regression: addressing potential endogeneity

In the second extended specification, we address potential endogeneity in our regression models. Thus far, we have examined the impact of holding internet WMPs on household decisions regarding stock market participation. However, it is crucial to consider the possibility of reverse causation, in which the experience of holding stocks may influence household decisions to purchase internet WMPs. Additionally, it is plausible that other personal characteristics simultaneously affect ownership of internet WMPs and the decision to participate in the stock market. To tackle these concerns regarding potential endogeneity, we incorporate IVs. These instruments are selected based on their ability to influence ownership of internet WMPs while not directly affecting household decisions regarding stock market participation.

Table 3
Internet WMPs holding ratio and stock market participation.

	<i>Stock_own</i>			<i>Stock_share</i>		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Inter_ratio</i>	0.789 *** (0.044)	0.641 *** (0.040)	0.613 *** (0.042)	0.199 *** (0.016)	0.177 *** (0.016)	0.175 *** (0.017)
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,863	37,029	34,119	37,877	37,043	34,133

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Table 4
Internet WMPs and stock market participation: IV regression results.

	First stage		Second stage			
	<i>Inter_dummy</i>	<i>Inter_ratio</i>	<i>Stock_own</i>	<i>Stock_share</i>	<i>Stock_own</i>	<i>Stock_share</i>
<i>Inter_dummy</i>			12.56 *** (1.185)	3.536 *** (0.432)		
<i>Inter_ratio</i>					13.27 *** (2.006)	3.741 *** (0.630)
<i>Smartphone</i>	0.130 *** (0.010)	0.124 *** (0.017)				
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes	Yes
AR			291.27 ***		301.49 ***	
Wald			112.48 ***		43.78 ***	
Cragg-Donald Wald F statistic				162.45 ***		48.88 ***
Observations	34,058	34,106	34,058	34,058	34,106	34,106

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

The CHFS survey provides data on smartphone usage in households, which we utilize to identify the adoption of digital finance. Specifically, the survey includes a question regarding the type of mobile phone used by respondents: “Which of the following types of cell phones are you using?” The response options consist of (1) Smartphones (enabling online shopping, social chat, etc.); (2) Non-smartphones; (3) No cell phone. We create a variable called *Smartphone* that takes a value of one if households select option (1), indicating the use of smartphones, and zero otherwise.

We posit that individuals commonly using smartphones are more inclined to adopt digital services and purchase more internet WMPs. However, it is crucial to acknowledge that other individual-specific (unobservable) factors might influence smartphone usage and stock holdings. Consequently, such factors can introduce measurement errors into our estimation.

To address this concern, we draw on the research conducted by [Krueger and Angrist \(2001\)](#) and employ group averages as IVs to mitigate measurement errors. Additionally, we incorporate peer effects as IVs, as suggested by [Bucher-Koenen and Lusardi \(2011\)](#) and [Tan et al. \(2022\)](#). Our study defines peers as households in the same county with a similar income level. We use the exposure to digital services of others in the same peer group as IVs. Specifically, we calculate the ratio of smartphones by these peers. This approach is based on three underlying assumptions. First, individuals exposed to a more advanced digital service environment are more likely to use digital financial services. Second, the availability of digital services at the county level is influenced by technological advancements and socioeconomic conditions, which are exogenous to individual households and uncorrelated with unobservable individual-specific factors. Finally, the digital service use of others is beyond the control of the respondent, and the behavior of others does not directly impact household decisions about stock market participation.

The results of the IV regression are presented in Table 4, in which the IV is *Smartphone*. In the first-stage regression, the coefficients of *Smartphone* are significantly positive at the 1% level. This finding suggests that households in regions with a more advanced digital financial environment are more likely to purchase internet WMPs. Furthermore, we conduct a weak identification test, which is also reported in Table 4. The AR, Wald, and Cragg-Donald Wald F statistics are statistically significant at the 1% level. These results reject the null hypothesis of weak instruments, indicating that our choice of instruments is reasonable, and provide strong support for the validity of our IVs.

In the second-stage regression, the regression coefficients of both *Inter_dummy* and *Inter_ratio* are positive and statistically significant at the 1% level. This outcome indicates that the purchase of internet WMPs directly influences the decision to participate in the stock market. These findings alleviate potential concern that our proxy for internet WMPs is related to other household characteristics that could also be correlated with the decision to participate in the stock market. The results provide robust evidence that acquiring internet WMPs significantly shapes households' stock market participation decisions.

4.3. Mechanism analysis

Our findings thus far provide evidence of the positive effect of purchasing internet WMPs on stock market participation. In this subsection, we explore potential underlying mechanisms explaining the relationship between internet WMP investments and stock market participation. Based on theoretical analysis, we posit that the experience of purchasing internet WMPs can effectively enhance individuals' financial awareness, leading them to pay closer attention to financial news. This enhancement in financial awareness is expected to reduce the cost of gathering information for stock market participation. As a result, households are more likely to invest in the stock market. To test this hypothesis, we examine the mediating effect of financial awareness. By exploring the mediating role of financial awareness, we shed light on the mechanisms through which internet WMP purchases influence stock market participation.

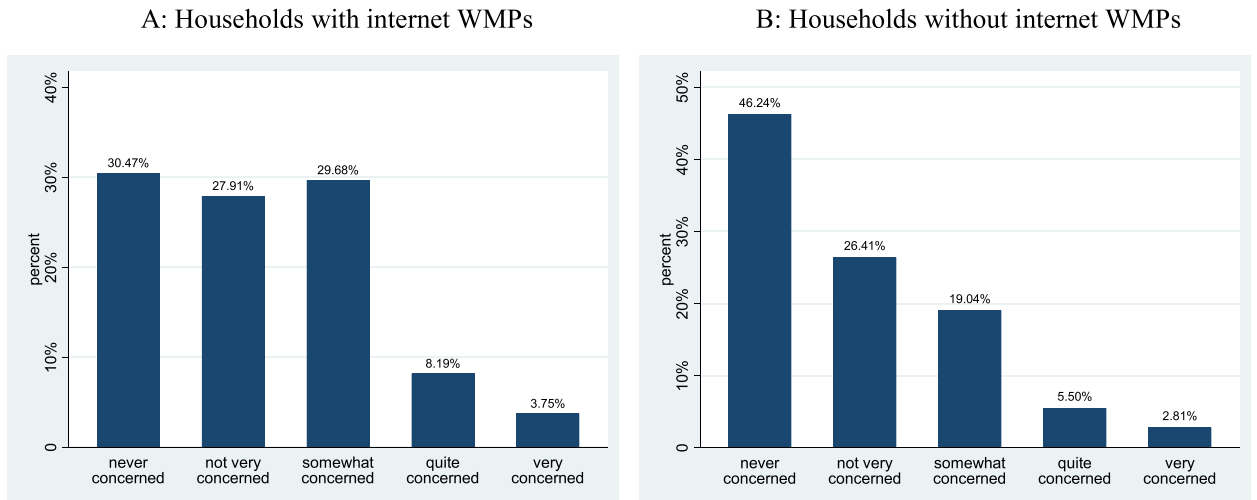


Fig. 1. Internet WMPs and the level of concern about financial news.

4.3.1. Preliminary analysis

To identify the mediating mechanism, we introduce the variable *Financial awareness* to our analysis. In the CHFS survey, respondents are asked to indicate their concern regarding economic and financial news on a five-point scale from 1 = “never concerned” to 5 = “very concerned.” We believe that financial awareness increases as the level of concern about financial news intensifies. Therefore, we assign a value of 1–5 to represent increasing levels of financial awareness, with higher values indicating greater concern about financial news.

Fig. 1 illustrates the results related to this issue, demonstrating that households with internet WMPs have a higher level of concern about financial news than those without internet WMPs. Specifically, in the group of households with internet WMPs, the combined proportion of respondents who said they were “never concerned” and “not very concerned” is 58.38% (30.47% plus 27.91%). This proportion is significantly lower among households without internet WMPs: 72.65% (46.24% plus 26.41%). It indicates that internet WMPs may play a role in increasing household interest in and attention to financial news.

We conducted further analysis to explore the relationship between stock market participation and the level of financial awareness, and the results presented in Fig. 2 align with our expectations. In Panel A, households that were “very concerned” and “quite concerned” about financial news have rates of stock market participation of 12.61% and 13.73%, respectively. In contrast, households that were “not very concerned” and “never concerned” have lower participation rates: only 5.04% and 2.39%, respectively. In Panel B, we analyze the stock asset allocation ratios for households based on their level of attention to financial news. We find that households that were “very concerned” and “quite concerned” about financial news allocate a higher proportion of their total assets to stocks: 0.48% and 0.57%, respectively. Conversely, households that were “not very concerned” and “never concerned” allocate considerably lower ratios: 0.14% and 0.08%, respectively. These findings show that the influence of internet WMP purchases on stock market participation operates through the channel of financial awareness. Therefore, Fig. 2 reinforces the connection between financial awareness, stock market participation, and household asset allocation.

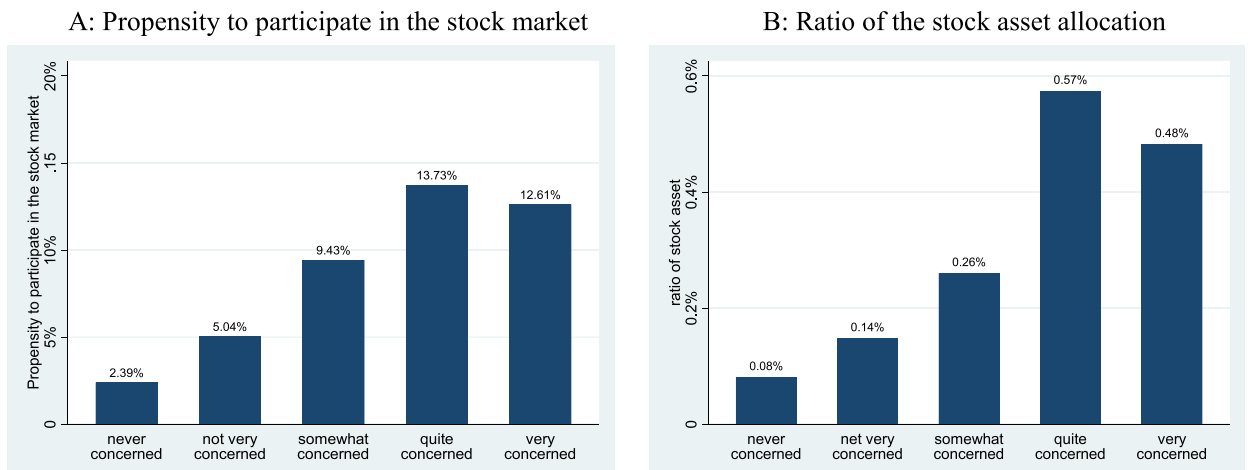


Fig. 2. The level of concern about financial news and stock market participation.

Table 5
Internet WMPs and stock market participation: mechanism analysis.

Panel A: Independent variable is <i>Inter_dummy</i>					
	(1)	(2)	(3)	(4)	(6)
Variables	<i>Financial news</i>	<i>Stock_own</i>	<i>Stock_own</i>	<i>Stock_share</i>	<i>Stock_share</i>
<i>Inter_dummy</i>	0.103 *** (0.022)	1.711 *** (0.082)	1.639 *** (0.081)	0.328 *** (0.029)	0.307 *** (0.029)
<i>Financial awareness</i>			0.363 *** (0.027)		0.017 * (0.009)
Household characteristics	Yes	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes
Sobel test		0.010 *** (0.001)		0.037 *** (0.003)	
Observations	33,999	34,071	33,975	34,080	33,983
Panel B: Independent variable is <i>Inter_ratio</i>					
	(1)	(2)	(3)	(4)	(6)
Variables	<i>Financial news</i>	<i>Stock_own</i>	<i>Stock_own</i>	<i>Stock_share</i>	<i>Stock_share</i>
<i>Inter_ratio</i>	0.040 *** (0.012)	0.613 *** (0.042)	0.573 *** (0.041)	0.175 *** (0.017)	0.164 *** (0.017)
<i>Financial awareness</i>			0.365 *** (0.026)		0.019 ** (0.009)
Household characteristics	Yes	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes
Sobel test		0.005 *** (0.001)		0.016 *** (0.001)	
Observations	34,047	34,119	34,023	34,133	34,036

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

4.3.2. Regression analysis

To examine the mediating effect of financial awareness, we conduct a regression analysis in two steps. In the first step, we construct a regression equation to assess the impact of internet WMP purchases on the levels of concern about financial news. This step helps determine whether investment in internet WMPs directly influences the mediating variable *Financial awareness*. The regression includes relevant variables, such as internet WMPs (*Inter_dummy* and *Inter_ratio*) as independent variables and the level of concern about financial news as the dependent variable. By analyzing the coefficients of the internet WMPs variables, we can determine the direct effect of internet WMP purchases on financial awareness. In the second step, we incorporate *Financial awareness* into our main regression. This step tests the significance of the mediating variable and observe whether the regression coefficient of the independent variable (*internet WMPs*) declines when the mediating effect is taken into account. The main regression includes the independent variable *internet WMPs*, the mediating variable *Financial awareness*, and other relevant control variables. By examining the significance of the coefficient for financial awareness and comparing the coefficient of internet WMPs before and after including the mediating variable, we determine the extent to which financial awareness mediates the relationship between internet WMP purchases and the dependent variable.

We present the estimated results in Table 5, where we investigate the mediating effect of financial awareness on stock market participation and asset holdings. In Columns (1)-(3), we examine the mediating effect of financial awareness on the probability of stock market participation. The estimated results in Column (1) show that internet WMPs has a positive and statistically significant coefficient, indicating that purchases of internet WMPs significantly impact increasing financial awareness. In Column (3), the coefficient of financial awareness is significantly positive. Additionally, the Sobel tests, which assess the significance of the indirect effect, indicate significance at the 1% level. These results suggest that the increase in financial awareness partially explains the effect of internet WMPs on stock market participation.

In Columns (4)-(6), we examine the mediating effect of financial awareness on stock asset holdings. As in the earlier findings, the coefficient of internet WMPs in Column (4) is positive and statistically significant at the 1% level, indicating that purchases of internet WMPs positively influence financial awareness. Moreover, in Column (6), the coefficient of financial awareness is significantly positive, and the Sobel tests confirm its significant mediating effect at the 1% level. These results indicate that financial awareness mediates the relationship between internet WMPs and household decisions regarding stock asset holdings. The findings in Table 5 support the mediating role of financial awareness in the relationship between internet WMPs and stock market participation and asset holdings.

4.4. Heterogeneity test

Our theoretical analysis acknowledges that purchases of internet WMPs can potentially increase the probability of stock market participation by influencing household risk tolerance. However, risk tolerance can vary among households or individuals because of differences in household and regional characteristics. To explore this heterogeneity, we conduct an analysis based on the characteristics that influence household risk tolerance, including the number of years of education, income risk, and regional financial development. Specifically, we estimate separate regression models for each characteristic, incorporating the relevant variables and controlling for other factors. This enables us to investigate differences in the effect of internet WMPs on stock market participation at different levels of the characteristic.

4.4.1. Education

Education significantly influences individual participation in decision-making about the stock market. Grable et al. (2019) highlight the impact of a person's education background on stock market participation. Individuals with higher education levels tend to have lower information-gathering costs and are more likely to make informed investment decisions. Calvet et al. (2007) suggest that individuals with less education are likely to hold poorly diversified portfolios, indicating higher information-gathering costs for these households than those with higher education. Given that purchasing internet WMPs can potentially reduce information-gathering costs and promote stock market participation, we can expect the effect of internet WMPs on increasing stock market participation to be even more pronounced among individuals with lower education and higher information-gathering costs. By reducing the barriers associated with information-gathering costs, internet WMPs may serve as a more accessible way for these individuals to participate in the stock market.

To examine the differential impact of internet WMPs on stock market participation based on education levels, we divide the sample households into two subgroups: a high-education group and a low-education group. The high-education group comprises households with average education levels (measured in the number of years of education) above than the mean. In contrast, the low-education group comprises households with average education levels below the mean.

We then estimate regression models separately for each subgroup and analyze the results, which are reported in Table 6. The regression coefficients of internet WMPs are larger and more statistically significant in the low-education group than in the high-education group. This finding is consistent with our expectations, suggesting that the effect of internet WMPs on promoting stock market participation is more pronounced among households with lower education. The results suggest that internet WMPs play a particularly important role in reducing information-gathering costs and facilitating stock market participation among households with less education, who typically face higher barriers to participation.

4.4.2. Income risk

Background risk, such as the risk associated with income fluctuation, plays a crucial role in shaping investment decisions as it deters households from taking risks in financial markets (Heaton and Lucas, 2000). Niu et al. (2020) find that people in China who are self-employed have greater income volatility, are less inclined to invest in stocks or generally prefer less risky investment portfolios. In this context, internet WMPs can be seen as a mechanism that weakens the influence of income risk. Consequently, we expect the influence of internet WMPs on stock market participation to be less pronounced among self-employed household heads than other groups.

Table 6
Differences in internet WMPs affected by education.

	<i>Stock_own</i>		<i>Stock_share</i>	
	Low education (1)	High education (2)	Low education (3)	High education (5)
Panel A: Independent variable is <i>Inter_dummy</i>				
<i>Inter_dummy</i>	2.439 *** (0.236)	1.472 *** (0.097)	0.396 *** (0.047)	0.238 *** (0.041)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes
Observations	17,022	17,049	17,030	17,050
Panel B: Independent variable is <i>Inter_ratio</i>				
<i>Inter_ratio</i>	0.865 *** (0.114)	0.532 *** (0.050)	0.174 *** (0.023)	0.161 *** (0.027)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes
Observations	17,052	17,067	17,065	17,068

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

Table 7

Differences in internet WMPs affected by income risk.

	<i>Stock_own</i>		<i>Stock_share</i>	
	Self-employed (1)	Non-Self-employed (2)	Self-employed (3)	Non-Self-employed (5)
Panel A: Independent variable is <i>Inter_dummy</i>				
<i>Inter_dummy</i>	1.515 *** (0.238)	1.744 *** (0.088)	0.132 (0.128)	0.339 *** (0.031)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes
Observations	2923	31,148	2925	31,155
Panel B: Independent variable is <i>Inter_ratio</i>				
<i>Inter_ratio</i>	0.539 *** (0.130)	0.629 *** (0.045)	-0.047 (0.080)	0.195 *** (0.018)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes
Observations	2922	31,197	2924	31,209

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

We divided the sample households into two subgroups: self-employed and non-self-employed. The results of the regression analysis are presented in Table 7. In the non-self-employed group, the regression coefficients associated with internet WMPs are larger and more statistically significant than the other subgroup. These findings suggest that the impact of purchases of internet WMPs is less pronounced among self-employed households. This result supports our initial expectation that the presence of income risk attenuates the effect of internet WMPs.

4.4.3. Regional financial development

The level of financial development plays a significant role in facilitating social and economic interactions, and it is also an essential factor that influences the costs for individuals associated with gathering information (Hong et al., 2004; Liang and Guo, 2015). Typically, regions with less developed financial markets tend to have higher information-gathering costs. Therefore, we assume that the impact of purchasing WMPs is more pronounced for households in regions with less financial market development. The rationale for this assumption is that households in regions with less developed financial markets face higher information-gathering costs. Therefore, the effect of purchasing internet WMPs, which facilitate access to investment information, is expected to significantly influence households in these regions more than those in areas with more abundant financial resources.

To measure regional financial development in the Chinese financial sector, we use the ratio of deposits and loans outstanding in the banking sector to the gross domestic product (GDP) at the provincial level. This measure helps us differentiate among regions with varying degrees of financial development. We then divide our sample into two subsamples based on this measure. The first subsample consists of households in regions with a ratio of deposits and loans below the mean, representing the group in regions with low financial development, and the second subsample comprises households in regions with a ratio of deposits and loans above the mean, representing the group in regions with high financial development. The results of this analysis are presented in Table 8.

In Table 8, the coefficients associated with internet WMPs are higher in the low financial development group than the high financial development group. This finding indicates that the impact on stock market participation of purchasing internet WMPs is greater in regions with less developed financial markets than in regions with higher financial development. The results confirm our initial expectations and suggest that purchases of internet WMPs have a larger impact on people who live in regions with less developed financial markets with respect to their participation in the stock market.

4.5. Robustness tests

4.5.1. Alternative measures of variables

In our main analysis, we examine the relationship between purchases of internet WMPs and household investment in stocks and mutual funds, which are considered their primary financial assets. However, portfolio diversification can also be achieved through the acquisition of other high-yield financial assets, such as bonds, gold, foreign exchange, and financial derivatives, so we extend our investigation to encompass all of these household financial assets in order to conduct a more comprehensive analysis. The results are presented in Table 9.

In Table 9, the coefficients associated with internet WMPs remain positive and statistically significant at the 1% level. This indicates that the effect of internet WMPs on household investment decisions is robust even after we consider alternative measures of the main variables and include a broader range of financial assets in the analysis. The similarity between the coefficients in this analysis and the baseline analysis suggests that the influence of internet WMPs on household investment behavior holds consistently across different measures and a broader set of financial assets.

Table 8
Differences in internet WMPs affected by regional financial development.

	<i>Stock_own</i>		<i>Stock_share</i>	
	Low development	High development	Low development	High development
	(1)	(2)	(3)	(5)
Panel A: Independent variable is <i>Inter_dummy</i>				
<i>Inter_dummy</i>	1.809 *** (0.124)	1.641 *** (0.109)	0.348 *** (0.040)	0.310 *** (0.042)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Observations	17,196	16,875	17,197	16,883
Panel B: Independent variable is <i>Inter_ratio</i>				
<i>Inter_ratio</i>	0.671 *** (0.060)	0.574 *** (0.059)	0.195 *** (0.022)	0.152 *** (0.026)
Household characteristics	Yes	Yes	Yes	Yes
Characteristics of household heads	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Observations	17,229	16,890	17,233	16,900

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

Table 9
Robustness tests: Alternative measures of variables.

	(1)	(2)
	<i>Financial asset ownership</i>	<i>Financial asset share</i>
Panel A: Independent variable is <i>Inter_dummy</i>		
<i>Inter_dummy</i>	0.540 *** (0.012)	0.074 *** (0.013)
Household characteristics	Yes	Yes
Characteristics of household heads	Yes	Yes
Province dummies	Yes	Yes
Observations	34,077	34,077
Panel B: Independent variable is <i>Inter_ratio</i>		
<i>Inter_ratio</i>	0.174 *** (0.077)	0.023 *** (0.007)
Household characteristics	Yes	Yes
Characteristics of household heads	Yes	Yes
Province dummies	Yes	Yes
Observations	34,077	34,077

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

4.5.2. Propensity Score Matching (PSM)

In this section, we employ the propensity score matching (PSM) method to analyze the impact of purchasing internet WMPs. PSM is a widely used evaluation technique that enables us to estimate the average effect of specific individuals or groups (Rosenbaum and Rubin, 1983). It involves comparing the outcomes of participants who have purchased internet WMPs' with those of matched nonpurchasers based on their similarity in observed characteristics. To obtain the propensity scores, we employ a logit model in which the endogenous variable is whether individuals have obtained internet WMPs. These estimated propensity scores are then used to construct matched samples. In this paper, we use kernel matching to generate the matched samples.

Before we perform the matching analysis, we need to address the significant differences between households that purchased internet WMPs from those that did not in terms of various characteristics, as indicated in Table 10 and Fig. 3. These differences suggest that the two groups may have distinct profiles and potentially confounding factors that could influence the outcomes of interest. However, after sample matching is performed using PSM, the differences between the treatment group (investors in internet WMPs) and the control group (non-investors) become substantially smaller. This indicates that the matching process successfully balances the observed characteristics between the two groups, mitigating potential biases based on these differences.

Table 11 presents the average treatment effects on the treated (ATT) for the impact of internet WMPs' purchases on stock market participation and the ratio of stock assets. The results indicate that households with internet WMPs (the treatment group) have a significantly higher probability of participating in stock markets than other households (the control group). Specifically, the probability of stock market participation by households with internet WMPs is estimated to be 20.8%, whereas the probability for other households is only 6.7% on average. This difference of 14.1% points is statistically significant at the 1% level, indicating that the impact of internet WMPs' purchases on stock market participation is substantial. Similarly, the ratio of stock assets for households

Table 10
Mean comparison of variables of PSM.

Variable	Matched	Treated	Control	<i>t</i>
<i>logAsset</i>	Unmatched	13.26	12.37	23.24 ***
	Matched	13.26	13.04	4.16 ***
<i>logIncome</i>	Unmatched	10.97	10.25	19.19 ***
	Matched	10.97	10.80	3.86 ***
<i>Number</i>	Unmatched	3.469	3.318	4.26 ***
	Matched	3.469	3.429	0.88
<i>Education</i>	Unmatched	9.274	7.752	19.39 ***
	Matched	9.274	8.939	3.14 ***
<i>Gender</i>	Unmatched	0.770	0.797	-2.94 ***
	Matched	0.770	0.776	-0.43
<i>Age</i>	Unmatched	51.28	56.61	-18.86 ***
	Matched	51.28	52.44	-2.89 ***
<i>Married</i>	Unmatched	0.943	0.911	5.10 ***
	Matched	0.943	0.936	0.95
<i>Party</i>	Unmatched	0.200	0.175	2.84 ***
	Matched	0.200	0.193	0.53
<i>Self_employed</i>	Unmatched	0.139	0.082	9.09 ***
	Matched	0.139	0.129	0.99

Notes: ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

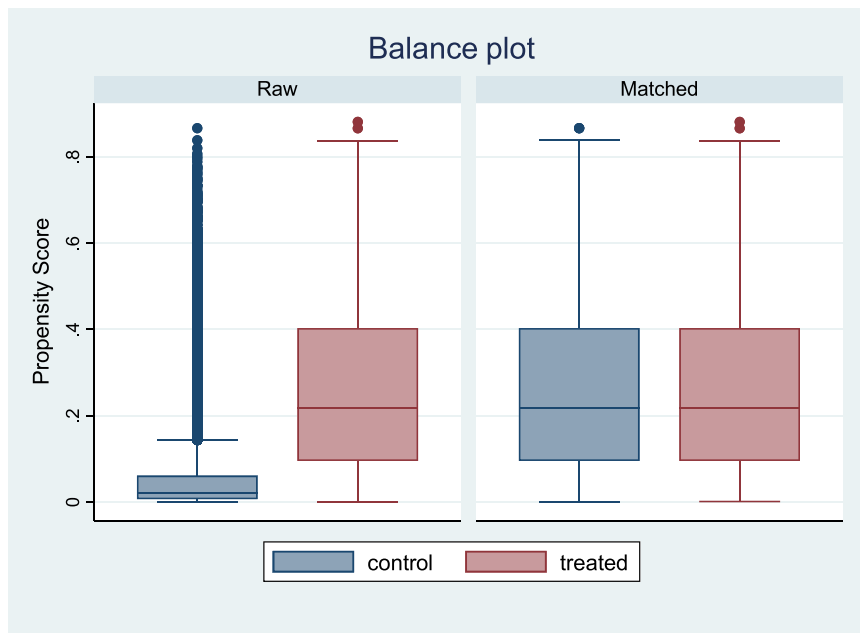


Fig. 3. Propensity score.

Table 11
Average treatment effect on the treated (ATT) for households with/without internet WMPs.

	Treatment	Control	ATT	S.E.	T-Value
<i>Stock_own</i>	0.208	0.067	0.141	0.009	15.77 ***
<i>Stock_share</i>	0.579	0.203	0.376	0.041	9.15 ***

Notes: ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

with internet WMPs is estimated at 0.579%, whereas it is only 0.202% for other households. The difference in the ratio of stock assets (ATT = 0.376%) is also statistically significant at the 1% level, indicating a considerable disparity in stock ownership between the treatment and control groups. These findings are consistent with the results from our baseline analysis, demonstrating the robustness of our main results regarding the impact of purchasing internet WMPs on stock market participation and the accumulation of stock assets.

Table 12
Robustness tests: Sample selection.

Variables	(1) <i>Stock_own</i>	(2) <i>Stock_share</i>
Panel A: Independent variable is <i>Inter_dummy</i>		
<i>Inter_dummy</i>	1.775 *** (0.094)	0.300 *** (0.029)
Household characteristics	Yes	Yes
Characteristics of household head	Yes	Yes
Year dummies	Yes	Yes
Household dummies	Yes	Yes
Observations	30,234	30,245
Panel B: Independent variable is <i>Inter_ratio</i>		
<i>Inter_ratio</i>	0.635 *** (0.046)	0.162 *** (0.017)
Household characteristics	Yes	Yes
Characteristics of household head	Yes	Yes
Year dummies	Yes	Yes
Household dummies	Yes	Yes
Observations	30,278	30,294

Notes: Standard errors are reported in parentheses. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively. Control variables are the same as in Table 2.

4.5.3. Sample selection

To enhance the representativeness of our samples, we excluded household samples from three cities that have well-developed stock markets: Beijing, Shanghai, and Guangzhou. By doing so, we mitigate any potential bias from the specific characteristics of these regions and ensure that our findings are more generalizable. Table 12 presents the results obtained after excluding the household samples from these three cities. The results remain consistent with those from the principal analysis. This similarity confirms the robustness of our findings, suggesting that the observed effect of purchasing internet WMPs on stock market participation persists even after the exclusion of households from these highly developed stock market regions is accounted for.

5. Conclusion, implications, and limitations

This study is motivated by the increasing number of people in China who regard internet-based wealth management products crucial in managing their finances. This study investigates whether purchasing internet WMPs can promote individuals' financial awareness and encourage households to participate in the stock market. Initially, we examine the correlation between internet WMPs and household participation in the stock market. Subsequently, we delve deeper to understand the influencing channels through which internet WMPs affect household inclinations toward stock market participation.

Our findings strongly indicate that in China purchasing internet WMPs has a significantly positive impact on the household propensity to invest in the stock market. Moreover, we reveal that households with internet WMPs demonstrate greater interest in financial news, as their ownership of these products enhances their financial awareness. Furthermore, our results confirm that the influence of internet WMPs is more pronounced among households with higher financial literacy and education, which live in regions with more developed financial markets. These findings suggest that purchasing internet WMPs can augment households' stock market participation through heightened individual financial awareness.

Our findings lead to significant policy and practical implications. A flourishing stock market is a vital indicator of a country's robust and sustainable economy, and stock market participation effectively contributes to reductions in wealth disparities among the population. Consequently, governments should make extraordinary efforts to support the growth of digital financial services by strengthening the financial infrastructure and enacting supportive legislation. This support enhances household financial awareness and encourages investment in the stock market. Furthermore, holding digital finance products, such as internet WMPs, gives individuals an effective way to accumulate investment experience. Therefore, digital finance providers should adopt a sustainable business strategy that ensures the diversified and user-friendly digital finance products to meet the needs of individual investors.

Specifically, the evidence from our study should encourage the Chinese government to continue to support the financial sector's development of digital finance products. The education system should also be strengthened to enhance household financial literacy and awareness through legislation, regulations, and policies. In addition, a stable political environment, fair competition, and adherence to market rules are crucial for the success of digital finance initiatives. Our study highlights the importance of government support for digital financial services, the responsibility of digital finance providers in assuring product quality, and the significance of a stable political and regulatory environment. By focusing on them, policy makers and stakeholders can foster a conducive environment for growth in digital finance, which can contribute to a healthier economy, reduce wealth disparities, and improve household financial literacy.

Moreover, given China's leading role in digital finance, particularly in internet WMPs, our findings have significant implications for other countries, especially emerging markets that want their digital economies to thrive. The positive and significant role of internet WMPs in promoting stock market participation suggested in our study should encourage emerging markets' policymakers to promote digital financial development strategies, improve financial infrastructure and investment environment.

The development of digital finance is an irreversible trend, and embracing it can yield substantial benefits, as demonstrated in our study. Our results also highlight that developing internet WMPs is a rapid and cost-effective approach for reaching ordinary individuals and households, enhancing their financial awareness and literacy and participation in the financial market. Expanding the traditional stock market by adopting internet WMPs can significantly amplify the scale and popularity of a country's stock market. Consequently, the growth and efficient operation of the stock market indicates a country's level of development. Our findings indicate that investing in internet WMPs can expand the stock market. Finally, for low-income individuals and households, increasing income by investing in internet WMPs is a practical way to accumulate wealth. Governments should also view it as a strategy for accelerating financial inclusion.

Our study, which primarily focuses on research conducted within a single country and uses a specific survey dataset, has some limitations, which warrant further exploration in future research. The insights and findings derived from this study offer valuable perspectives on the subject matter, and future research could expand the scope by conducting similar studies in multiple countries or regions to enhance the robustness and generalizability of the findings. This would create broader understanding of the relationship between internet WMPs and stock market participation, considering economic, cultural, and regulatory differences among them. Additionally, employing diverse datasets and research methodologies could contribute to a more comprehensive understanding of the issue.

Declaration of Competing Interest

The authors declare no conflict of interest.

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