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Financial literacy and retail investors' financial welfare: Evidence from mutual fund investment outcomes in China

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ABSTRACT

This paper examines the financial literacy of mutual fund retail investors and its relationship with their investment outcomes. Using a unique dataset on Chinese mutual fund retail investors containing a survey on financial literacy, we find that women display significantly lower financial literacy than men. Investors with a higher level of education and richer investment experience have higher financial literacy. A one-standard-deviation increase in advanced financial literacy is associated with a probability decrease of an individual investor suffering a major loss by 1.940 percentage points, > 13% of the sample average. Highly literate investors also show more sophistication concerning fee-related issues: they are more likely to be aware of investment charges, to avoid high-fee funds sold by intermediaries, and to trade less. Moreover, we find that advanced literacy has a significantly larger impact on investment performance than basic literacy. These results can be helpful to the policy debate on the effects of financial education.

1. Introduction

Financial literacy has recently been garnering widespread attention, as it is acknowledged to be of great importance to consumer welfare since retail investors have increasingly exposed themselves to more complex financial markets. In their proposed theoretical framework for financial literacy, Lusardi and Mitchell (2014) argue that financial literacy helps individuals to earn higher returns on their savings, which boosts their financial welfare substantially. Most existing studies on financial literacy focus on the relationship between financial literacy and investment mistakes or biases. For example, Van Rooij et al. (2011) study the relationship between financial literacy and (limited) stock market participation. Von Gaudecker (2015) studies the relationship between financial literacy and portfolio (under) diversification. It should be noted, however, that these papers all focus on developed markets, for example the United States (US) and the Netherlands.

This paper investigates the financial literacy of individual investors within the context of the Chinese stock market, which is currently the second largest globally in terms of market capitalization, after the New York Stock Exchange. In addition to its size, the Chinese stock market possesses one unique feature, which makes the financial literacy of Chinese individual investors an interesting and important research subject. Like many other emerging countries, China's stock market is still underdeveloped. Its unique feature is that the Chinese stock market is dominated by relatively unsophisticated retail investors. This is very different from the US stock market, where sophisticated institutional investors dominate the market. This feature means that the US market is considered to be very efficient.[1] According to the 2014 China Household Finance Survey, around one third of Chinese investors lack a basic high

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[1] According to Titman et al. (2017) estimation, retail investors were responsible for 89.1% of the average daily trading volume during 2013–2015.

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school education.[2] In this context, “mistakes” or “biases” such as underdiversification or avoiding the stock market do not necessarily influence the welfare for retail investors negatively, especially on the Chinese stock market. Therefore, in this paper, we use a more straightforward measurement of individuals' welfare: investment outcomes.

In this paper, we acquire a unique dataset of mutual fund investment performances and the financial literacy of > 30,000 Chinese individual investors to investigate the relationship between financial literacy and retail investors' mutual fund investment outcomes. Our research question is: Do individual investors' mutual fund investment outcomes vary when they have different levels of financial literacy? How do different categories of financial literacy influence investment outcomes?

It is theoretically unclear whether financial literacy could improve retail investors' welfare when they rely on professional managers to allocate their assets. There is a longstanding academic and policy debate regarding the relationship between financial education and financial advice. This topic is of particular interest to financial market regulators, as financial education has become a national strategy for many countries. A strand of current financial literature argues that financial advice may be a substitute for financial literacy. For instance, von Gaudecker (2015) shows that households with either higher levels of financial literacy or those relying on professional financial advisers can achieve adequate portfolio diversification. In particular, for those who rely on professional advice, financial knowledge has no impact on return loss due to underdiversification. Moreover, Willis (2011) argues that professional advisers—rather than financial education—would be more beneficial to the functioning of the consumer financial market, considering the substantial costs of financial education programs. At the same time, a significant strand of financial literature emphasizes the importance of financial literacy to enhance consumers' welfare, for example promoting their investment returns (Lusardi and Mitchell, 2014). Therefore, whether financial literacy becomes immaterial in the presence of professional advisers has hitherto been an ambiguous topic. In this paper, we aim to explore and clarify this topic by empirically examining whether individuals' financial literacy has an impact on their realized returns when they delegate the majority of their financial decisions to mutual fund managers.

Understanding the role of financial literacy in individual mutual fund investment performance is also important for the following reasons: first, individual investors are increasingly buying shares in mutual funds to invest on the equity market. As French (2008, p. 1539) reports: “Individuals hold 47.9% of the market in 1980 and only 21.5% in 2007. This decline is matched by an increase in the holdings of open-end mutual funds, from 4.6% in 1980 to 32.4% in 2007.” This case is similar to that of China. According to the 2014 China Family Panel Studies Survey,[3] among the households with exposure to equity assets, approximately 40% invest in the stock market by holding shares in a mutual fund. The investment performance of mutual funds is therefore strongly related to ordinary consumers' financial welfare. Second, the Chinese mutual fund industry is still in its infancy, compared with the capital market. Given that retail investors account for a large portion of Chinese stock market investors, mutual funds—as one of the most important institutional investor groups—represent a growing part of the financial market. It is therefore becoming increasingly important to understand the underlying determinants of investment outcomes in mutual funds.

Given that the theory assumes that financial literacy improves individuals' returns on their savings (Lusardi and Mitchell, 2014), there is surprisingly little direct evidence of the relationship between financial literacy and retail investors' investment outcomes. One possible reason for this limitation is that it is quite difficult to obtain direct data on investors' investment returns from financial intermediaries as well as data on investors' financial literacy. To overcome this difficulty, we design a special module to address financial literacy according to the work of Van Rooij et al. (2011) and apply it to the 2015 China Mutual Fund Investor Investigation, a dataset of a representative sample of Chinese mutual fund retail investors investigating their investment performances. This study's access to this novel dataset allows us to directly examine the relationship between individual investors' financial literacy and their mutual fund investment outcomes.

Our empirical results show that individual investors with higher financial literacy are more likely to realize higher returns on their mutual fund investments. The extent of this effect is sizable. A one-standard-deviation increase in advanced (basic) financial literacy decreases the probability of an individual investor suffering a major loss on mutual fund investments by approximately 1.940 (0.713) percentage points, a decrease of 13% (5%) in the probability of a major loss. The effect is comparable to the effect of formal university education and wealth. Considering the different categories of financial literacy, we find that the impact of more advanced financial literacy is significantly larger than that of basic literacy. The results are robust, even when accounting for investors' different investment styles, which may contribute to different levels of returns.

Considering how financial literacy delivers benefits to mutual fund investors, it is possible that investors with higher financial literacy also deal with fee-related issues with more sophistication. We provide evidence that advanced financial literacy helps individuals to resist the temptation of overtrading by −0.226% (a 4.4% decrease), to avoid ignorance concerning investment charges by −0.751% (an 11% decrease), and to avoid high-fee purchasing channels by −3.184% (a 12.1% decrease). Moreover, the results show that advanced literacy has a significantly larger impact on sophistication concerning the issue of fees than basic financial literacy. For example, to avoid unawareness of investment charges, the magnitude of advanced financial literacy's effect is more than three times of that of basic literacy.

This paper makes three contributions to the existing literature. First, we document the quantifiable effects of financial literacy on

[2] Xiong and Yu (2011) document high prices for way out of the money Chinese put warrants that were effectively worthless, which indicates the influence of the prevalence of unsophisticated retail investors in the Chinese market.

[3] China Family Panel Studies (CFPS) is a nationally representative, annual longitudinal survey of Chinese communities, families, and individuals launched in 2010 by the Institute of Social Science Survey (ISSS) of Peking University, China. For more information, please refer to Xie and Hu (2014).

individual investors' mutual fund investment returns and fee sophistication. It is important to note that—relative to basic literacy—our comparisons show the greater importance of advanced literacy in the context of Chinese mutual fund investments. This may illuminate the longstanding policy debate on how financial education programs should enhance an individual's financial literacy, thereby promoting their welfare.

Second, we contribute to the literature on financial literacy (e.g., Lusardi and Mitchell, 2007a, 2007b; Lusardi and Tufano, 2009; Van Rooij et al., 2012) in new and relevant ways. Most existing financial literacy studies focus on financial decision making or behavioral biases, rather than on a direct measure of consumers' financial welfare. Our paper di□ers from these existing studies in that it provides direct evidence that financial knowledge enables individual investors to realize higher returns on mutual fund investments. Lusardi and Mitchell's (2014) theoretical model assumes that financial knowledge leads to higher investment returns during an investor's life cycle. Our results lend further empirical support to this assumption.

Third, our study is also related to the literature on what drives investors' returns on mutual funds. Bailey et al. (2011) find that behaviorally biased investors are more likely to make poor decisions when choosing mutual funds, resulting in poor investment performance. Grinblatt et al. (2016) find that investors' cognitive abilities influence their mutual fund choices.[4] Our analysis demonstrates the di□erences among mutual fund investors with di□erent levels of financial literacy in terms of performance in investment returns. Our finding concerning the positive correlation between financial literacy and mutual fund investment performance provides additional evidence concerning this aspect.

Our findings have important policy implications. First, financial literacy di□ers substantially among individuals, depending on demographics (e.g., gender, age, education, and income) and investment experience. This suggests that financial education programs may be more e□ective if tailored to specific target groups of the population. Second, our findings show that—compared with basic literacy—advanced literacy is more important to improved investment performance. This implies that more advanced knowledge on the functioning of financial markets should be considered when designing financial education programs. Finally, policy makers should be aware that, when making investment decisions regarding their retirement savings, financially unsophisticated individuals may not earn positive returns, which may reduce their wealth and their wellbeing. Therefore, privatization programs that put the individual in charge of investing for their retirement are likely to be more e□ective when introduced together with well-planned financial education programs.

The remainder of the paper is as follows: Section 2 provides an overview of the Chinese stock market and related literature and proposes the research hypothesis. Section 3 presents the data, measurements, and model. Section 4 presents the results concerning the relationship between financial literacy and investment returns. Section 5 further discusses the relationship between financial literacy and fee-related issues and Section 6 concludes the paper.

2. Institutional background and hypothesis development

2.1. Chinese stock market setting

The Chinese stock market was created in the early 1990s and is now the second largest in the world. Unlike the US markets where institutional investors are major participants, in China's stock market, unsophisticated retail investors play a much more significant role, as approximately one third of Chinese retail investors lack a basic high school education. Liao et al. (2017) show that institutional investors (including mutual funds and other informed investors) accounted for < 15% of the Chinese stock market at the end of 2012, compared with > 60% in the US markets. Markets with many noise traders may have pronounced market volatility and large boom and bust cycles, as is shown in Fig. 1. The combination of unsophisticated retail investors' dominance and frequent market fluctuations creates an environment where sophisticated institutional investors can leverage their abilities, providing consumers with potential opportunities to beat the market (Liao et al., 2017).

The first Chinese mutual fund company was started in 1998, and in 2003, the Law on Securities Investment Fund was implemented. Fig. 2 shows the total assets under the management of China's mutual fund companies from 1998 to 2015, according to Cao (2016). Until 2015, there were 3867 mutual funds with asset under management (AUM) exceeding CNY 8 trillion, roughly equivalent to USD 1.2 trillion. The annual growth rate of AUM from 1998 to 2015 is approximately 50%. In the US, the AUM of the top 25 mutual funds exceeded USD 1.9 trillion in March 2016. Since the market size of China's mutual funds is still relatively small compared to that of the US, the Chinese mutual fund market has great potential, especially during process of the Chinese market opening to foreign investors.

2.2. Literature review and hypothesis

Whether individual investors with a higher level of financial literacy in a developing market such as China's stock market would have better mutual fund investment performance is an open question. One related study is Lusardi and Mitchell's (2014). Their work proposes a theoretical model on financial literacy over the life cycle. Their study perceive financial knowledge as “a form of investment in human capital” and in this sense, financial literacy allows individuals to earn higher returns on their savings. This means that from the perspective of mutual fund investment, financially literate investors are more likely to realize a higher return.

In the context of China, where unsophisticated retail investors dominate the stock market, more financially literate investors may

[4] A related literature strand focuses on how investors choose mutual funds based on funds' past performance (see Gruber, 1996; Zheng, 1999).

have more opportunities to exploit the market. Additionally, when choosing mutual funds, financial literacy may help investors to better process large amounts of information, consequently making better decisions. Grinblatt et al. (2016) documented that cognitive ability influences mutual fund choice. They find that high IQ investors are more likely to avoid funds with high fees. Therefore, financial literacy may help investors overcome behavioral biases and achieve higher investment returns.

However, some existing studies also argue that financial literacy may become immaterial in the presence of professional advisers. Von Gaudecker (2015) studies Dutch households and finds that households either have high levels of financial literacy or turn to professionals to realize better investment outcomes. This implies that if households rely on professional advice, their own financial literacy will not a□ect their investment outcomes. It is important to note that mutual fund investing is di□erent from direct investing in stocks. When individual investors buy shares in mutual funds, they e□ectively delegate their investment decisions to professional fund managers. Therefore, in the context of mutual fund investment when individual investors rely on fund managers to select stocks and timing, individual investors' own financial literacy may not matter.[5]

Our hypothesis assigns a positive role to individual investors' financial literacy in their mutual fund investment outcomes, as suggested by Lusardi and Mitchell (2014)

3. Data, variables, and model

3.1. Dataset

The data used in this study are from a unique comprehensive dataset on mutual fund retail investors. Mutual funds provide a specific and simple context for comparing the investment outcomes of individual investors. Additionally, mutual fund companies keep comprehensive and precise records of individual investors' personal information, including both transaction history and financial statements.

To the best of our knowledge, no existing dataset or literature has hitherto contained information on mutual fund investors' financial literacy or has connected this information to investor performance. To examine the relationship between financial literacy and investment outcome concerning individual mutual fund investors, we acquired this unique dataset from the 2015 China Mutual Fund Investor Investigation (CMFII). The CMFII is an annual investigation that gathers information about portfolio choice and investment outcomes. The investigation is administered by the Asset Management Association of China (AMAC), a self-regulatory organization that represents the mutual fund industry and is supervised by the China Securities Regulatory Commission. In 2015, AMAC set out to determine the financial literacy of retail investors. We cooperated with AMAC and accomplished two things: first, we designed sampling methods to ensure sample representativeness and second, we designed a module on financial literacy and added it to the investigation questionnaire in the 2015 wave.[6] AMAC executed the survey and requested mutual fund companies to collect and report the data. We acquired this data from AMAC through a data cooperation agreement.

The 2015 wave was performed in the first half of 2016 and it collected information on 30,051 individual investors. The 2015 investigation employed a stratified random sampling design in which the strata were formed based on investors' age, gender, and account balance. This ensures that the respondents are representative of all mutual fund account retail holders in China. Mutual fund companies collect information on their retail customers using their own systems. Data items include investors' gender, age, financial wealth under management, years since investing, investment performance, and their surveyed financial literacy. Details concerning the financial literacy module are provided in Section 3.2.

The respondents in this study are quite representative when comparing the age distribution in the sample to that of the account holder population. According to a 2015 AMAC report that contains statistics from the China Securities Depository and Clearing Corporation Limited—an agency providing registration, clearing, settlement, and custodian services for open-ended funds in the mainland market—the age distribution of retail mutual fund account holders' population is as follows: 19.43% are below 30 years old, 25.59% are between 30 and 40 years old, 25.97% are between 40 and 50 years old, 16.57% are between 50 and 60 years old, and 12.44% are older than 60 years. The distribution pattern of our sample (Table 1, Panel E) is quite similar to that of the population.[7] The sample covers individual investors from 69 fund management companies. The net worth of these mutual fund companies accounts for approximately 70% of the total net worth of the Chinese mutual fund market at the end of 2016.

3.2. Variable measurement

3.2.1. Financial literacy indices

The questionnaire includes two sets of questions specifically designed for measuring financial knowledge based on the work of Van Rooij et al. (2011) and Atkinson and Messy (2012). The specific questions are presented in the Appendix. The first set of questions is designed to assess basic economic concepts, such as the workings of interest rates and compounding, inflation, and time value. These concepts underlie financial investments and daily financial decision-making. The second set of questions evaluates advanced financial knowledge and covers issues specific to financial markets, such as the trade-o between return and risk, di erent financial asset classes, and the functioning of stock and bond markets. The questions are similar to those employed by Van Rooij et al. (2011), except for one question on the central bank.

To measure financial literacy, as suggested by Van Rooij et al. (2011), we use two variables: *Basic Literacy* and *Advanced Literacy,* which are consistent with the way we devised the financial literacy questions. The *Basic Literacy* level is determined by the number of right answers out of the first six questions and the level of *Advanced Literacy* by the number of right answers out of the last seven questions. As such, we have two types of literacy indices: the first index potentially measures basic economic knowledge and the second measures more advanced and specific financial knowledge. Table 1, Panel A shows that on average, the respondents provided 4.3 right answers to the first six questions (basic literacy) and 4.7 right answers to the second seven questions (advanced literacy).

To confirm the validity of these two indices and their features, we report the distribution of the financial literacy indices across demographic variables—including education, age, and gender—in Table 1, Panels B and C. First, we consider basic financial literacy in Panel B and find a strong relationship with education. Respondents with a high school education or below are most likely to fall in the lowest quartiles of the basic literacy index. Conversely, those with bachelor's degrees are most likely to fall in the highest quartile of the basic literacy index. Basic financial literacy also generally increases with age, as older respondents tend to display higher levels of basic financial knowledge. Concerning gender di erences, we find that women display slightly lower basic knowledge than men.

[6] As we cannot directly observe individual investors' trading behavior, we also devised a module of questions on investor's behaviors and added the module to the investigation. The questions are presented in Section 5.

[7] Unfortunately, we can only compare age distribution, since the AMAC report only discloses age distribution of the mutual fund account holder population.

Table 1
Summary statistics.

Panel A: Financial literacy

Variable	N	Mean	p25	p50	p75	Min	Max	S.D.
Basic Literacy	30,051	4.302	3	5	6	0	6	1.841
Advanced Literacy	30,051	4.651	3	5	6	0	7	1.958

Panel B. Basic literacy across demographics (percentages)

	Basic literacy quartiles			
Education	1	2	3	4
High school or below	32.1	21.3	18.4	28.2
College	23.7	24.4	19.1	32.8
Bachelor	18.1	18.9	18.6	44.4
Masterate or Doctorate	15.3	19.4	17.9	47.3
	Pearson chi^2 (9) = 889.09 (p = .000)			
	Basic literacy quartiles			
Age	1	2	3	4
Age ≤ 30	32.2	22.2	15.7	29.9
30 < Age ≤ 40	21.7	19.4	17.7	41.2
40 < Age ≤ 50	17.9	20.5	19.2	42.4
50 < Age ≤ 60	14.3	21.4	21.9	42.3
Age > 60	10.9	23.2	25.3	40.5
	Pearson chi^2 (12) = 922.5396 (p = .000)			
	Basic literacy quartiles			
Gender	1	2	3	4
female	22.9	23.6	19.4	34.1
male	20.8	19.1	18.1	42.1
	Pearson chi^2 (3) = 208.832 (p = .000)			
	Basic literacy quartiles			
Investment experience on mutual funds	1	2	3	4
< 12 month	42.0	29.2	13.7	15.0
12–24 month	25.4	23.0	18.4	33.2
24–60 month	15.4	19.0	21.4	44.1
> 60 month	6.7	14.2	21.2	57.9
	Pearson chi^2 (9) = 5.9e + 03 (p = .000)			

Panel C. Advanced literacy across demographics (percentages).

	Advanced literacy quartiles			
Education	1	2	3	4
High school or below	44.0	27.7	13.8	14.5
College	30.6	34.5	18.0	17.0
Bachelor	22.3	30.2	22.2	25.3
Masterate or Doctorate	23.8	24.2	21.7	30.3
	Pearson chi^2 (9) = 1.3e + 03 (p = .000)			
	Advanced literacy quartiles			
Age	1	2	3	4
Age ≤ 30	38.5	28.7	15.6	17.1
30 < Age ≤ 40	28.9	28.2	20.7	22.2
40 < Age ≤ 50	23.8	30.2	20.9	25.1
50 < Age ≤ 60	22.4	33.3	22.0	22.3
Age > 60	18.1	39.1	19	25.g.9
	Pearson chi^2			

This pattern is similar to what was reported by Van Rooij et al. (2011). Panel B also shows that basic literacy has a strong positive relationship with investment experience. Those with a longer history of mutual fund investments are more likely to have a higher level of basic financial knowledge.

Considering more advanced financial knowledge—presented in Table 1, Panel C—as expected, we find that advanced financial literacy increases with education. A large portion (44.0%) of respondents with a high school education or below displays the lowest level of literacy (first quartile). As we move to the higher quartiles of literacy, the proportion of respondents with higher education levels' attainment increases. However, even when we consider those with a bachelor's (masterate or doctorate) degree, only 25.3% (30.3%) are in the top quartile of advanced literacy. The proportion is 44.4% (47.3%) when considering basic literacy. Thus, even

respondents with high levels of education can display a low degree of financial knowledge (> 50% of the respondents with a bachelor's degree are below the median level of the advanced literacy index distribution). This means that while there is a strong correlation between education and financial literacy, education is an imperfect proxy for financial literacy and empirical studies that account for education may not fully account for the effect of financial knowledge.

Advanced literacy is quite low among the younger respondents and is relatively the highest among the middle-aged group (particularly 40 to 50). This declines slightly in respondents older than 60. This suggests that financial literacy may have a nonlinear relationship with age. Gender differences also exist when considering advanced literacy. Concerning investment experience, respondents with richer experience display much higher advanced knowledge than the less experienced respondents. However, even when considering those with more than five years' experience, only 34.2% are in the top quartile of advanced literacy (the proportion is 57.9% for basic literacy). This indicates that even experienced investors can have a low level of financial knowledge, which makes investment experience another imperfect proxy for financial literacy.

Table 2 presents a more formal analysis of the relationships between financial literacy and the demographic factors using an ordinary least squares estimation. Columns (1) and (2) show the results for basic financial literacy. Controlling for other factors, on average, men have a higher score (0.080–0.209, 4%–11% of the standard deviation [SD]) for basic literacy than women. Considering

Table 2
Underlying determinants of financial literacy.

	Basic literacy		Advanced literacy	
	(1)	(2)	(3)	(4)
Male	0.209***	0.080***	0.356***	0.208***
	(9.857)	(4.042)	(15.888)	(10.131)
Age (Basic group: Age < 30)				
30 < Age ≤ 40	0.466***	0.130***	0.416***	−0.038
	(16.409)	(4.757)	(13.921)	(−1.336)
40 < Age ≤ 50	0.652***	0.222***	0.672***	0.083***
	(22.592)	(7.690)	(22.102)	(2.768)
50 < Age ≤ 60	0.828***	0.315***	0.721***	0.045
	(21.541)	(8.365)	(17.804)	(1.155)
Age > 60	1.003***	0.434***	0.896***	0.183***
	(22.061)	(9.923)	(18.709)	(4.023)
Education attainment (Basic group: < college)				
College	0.325***	0.227***	0.606***	0.437***
	(10.008)	(7.480)	(17.691)	(13.854)
Bachelor	0.737***	0.531***	1.111***	0.774***
	(24.616)	(18.459)	(35.247)	(25.892)
Masterate or Doctorate	0.878***	0.733***	1.141***	0.834***
	(22.354)	(19.282)	(27.574)	(21.119)
Personal Income (Basic group: < 50, thousands CNY)				
50 < Income ≤100		0.009		0.106***
		(0.347)		(3.965)
100 < Income ≤150		−0.363***		−0.203***
		(−12.007)		(−6.473)
150 < Income ≤500		−0.310***		−0.150***
		(−8.703)		(−4.056)
Income > 500		−0.480***		−0.374***
		(−9.871)		(−7.402)
Financial Assets (Basic group: FinAssets < 50, thousands CNY)				
50 < FinAssets ≤100		−0.082***		0.130***
		(−2.700)		(4.124)
100 < FinAssets ≤500		0.038		0.375***
		(1.232)		(11.560)
500 < FinAssets ≤1000		−0.066*		0.208***
		(−1.777)		(5.405)
1000 < FinAssets ≤3000		−0.143***		0.190***
		(−3.380)		(4.313)
FinAssets > 3000		−0.208***		0.035**
		(−4.119)		(0.674)
Investing experience on mutual funds (Basic group: < 12 month)				
12–24 month		0.761***		0.943***
		(26.550)		(31.646)
24–60 month		1.251***		1.388***
		(41.419)		(44.199)
> 60 month		1.736***		1.907***
		(65.090)		(68.790)
(Ever) Employed in financial sector		0.465		0.284
		(0.798)		(0.877)
Observations	30,051	30,051	30,051	30,051
Pseudo R^2	0.054	0.198	0.071	0.233

This table is based on a sample of individual mutual fund investors in China. We relate the individual investors' financial literacy to demographic the factors. The dependent variables shown in columns (1) and (2) refer to Basic Literacy and those in columns (3) and (4) to Advanced Literacy. The explanatory variables include gender, age, education level, personal income, financial asset status, and investment experience. T-statistics are reported in parentheses. *** indicates the coe□cient is di□erent from zero at the 1% level, ** at the 5% level, and * at the 10% level.

The summary statistics for investment outcome and control variables are shown in Table 1, Panels D and E. There are 30,051 mutual fund retail investors in the dataset. Investors and their investment performance in mutual funds can be summarized as follows: the median investor is a 30–40-year-old male with a bachelor's degree and an income of CNY 50,000–100,000 in 2015. This investor also has CNY 100,000–500,000 worth of financial assets to invest. The typical investor has more than five years' experience in mutual fund investing without being employed in the financial industry and has roughly broken even in their investment performance.

3.3. Econometric model

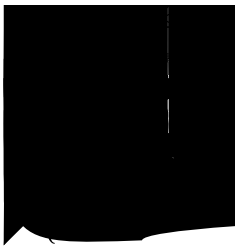
Our study aims to examine the relationship between financial literacy and the mutual fund investment performance of retail investors. As suggested by Winship and Mare (1984), we use an ordered logistic model[8] to examine the probability of better performance in mutual fund investment in connection with the financial literacy of retail investors. The ordered logit model is employed, as the only dependent variable we can observe is ordinal. Mutual fund companies only provide a range—rather than an exact value—of the realized returns of each investor due to privacy concerns. In the case of our model, the only observable dependent variable is categorical investment performance, denoted as r_i for each investor i, which takes the value 1 for a major loss (above 30%), 2 for a minor loss (below 30%), 3 for roughly breaking even, 4 for a minor gain (below 30%), 5 for a sizeable gain (from 30% to 100%), and 6 for a significant gain (above 100%). This shows why a traditional ordinary least squares or logistic regression model is not suitable for our analysis.

The specification of the ordered logistic model is as follows:

$$r^*_i = \alpha + \beta \times Financial\ literacy_i + \gamma X_i + \varepsilon_i, \tag{1}$$

where r^*_i represents a monotonically increasing transformation of actual realized returns, X_i denotes all control variables, and $_i$ is the error term, which is assumed to have a standard logistic distribution. Moreover, β measures the marginal e□ect of financial literacy on r^*_i. A significantly positive (negative) β value indicates that financial knowledge is positively (negatively) related to investment returns.

We can only observe the return performance in mutual fund investments (r_i) for each retail investor i, which is assumed to have the following relationship with the unobservable score for investment return r^*_i:



(2)

where μ_1, μ_2, μ_3, μ_4, and μ_5 are unknown cuto□ points to di□erentiate between return performance categories.

We use a maximum likelihood estimation to estimate β, γ, μ_1, μ_2, μ_3, μ_4, and μ_5. Next, we transform the estimated coe□cient to the marginal e□ect of financial knowledge on the probability of each category of return performance, as we are more interested in the marginal e□ect. The marginal e□ect is calculated as follows:

$$\partial \quad = \qquad \partial \qquad = \qquad (,)/(iiii1 \tag{3}$$

$$\partial P\ r = k \quad Financial\ literacy\ \ X \quad \partial Financial\ literacy$$
$$= \beta * \ \ l\ \mu\ \_ \ - \beta Financial\ literacy - \gamma X \ - l\ \mu \ - \beta \qquad - \tag{4}$$

where k = 2, 3, 4, and 5.

$$\partial P(r_i = 6 \mid Financial\ literacy_i, X)/\partial Financial\ literacy_i = \beta * [l(\mu_5 - \beta Financial\ literacy_i - \gamma X)], \tag{5}$$

where l(.) represents the density function of the standard logistic distribution. In Section 4, we report the coe□cients for the variables and interpret the results by calculating these marginal e□ects.

4. Main results: financial literacy and the investment performance of mutual funds

4.1. Baseline results

The main hypothesis of this paper is that respondents who are more financially knowledgeable are more likely to earn higher investment returns. We use the index for advanced literacy as a proxy for financial literacy. Our model also includes an index for basic literacy to account for di□erent categories of financial literacy, similar to the work of Van Rooij et al. (2011). This specification allows us to distinguish between the impacts of advanced literacy and basic literacy.

In Table 3, we report the estimates using three di□erent specifications: a basic specification that relates investment outcomes of mutual fund retail investors to their demographic factors (Column 1), a second specification in which we add our measure for financial literacy (Column 2), and a third specification in which we add an index of basic literacy (Column 3). We use an ordered logistic model to estimate the specifications, as the dependent variable is discrete and ordinal.

In the first specification (Column 1), gender, education, age, income, financial assets, working experience in the financial sector,

[8] For details on the model, please refer to McElvey and Zavoina (1975).

Table 3
Financial literacy and investment performance of mutual funds.

Panel A: Ordered logit regression estimates

Dependent variable: Investment performance
(1 = major loss, 2 = minor loss, 3 = roughly break even, 4 = minor gain, 5 = sizeable gain, 6 = significant gain)

	(1)	(2)	(3)
Advanced Literacy		0.111***	0.093***
		(16.091)	(11.499)
Basic Literacy			0.036***
			(4.052)
Male	0.048**	0.029	0.030
	(2.213)	(1.347)	(1.391)
(Ever) Employed in financial sector	0.125***	0.100***	0.090***
	(5.300)	(4.234)	(3.790)
Age (Basic group: Age < 30)			
30 < Age ≤ 40	−0.198***	−0.203***	−0.208***
	(−6.586)	(−6.746)	(−6.909)
40 < Age ≤ 50	−0.087***	−0.102***	−0.109***
	(−2.605)	(−3.079)	(−3.267)
50 < Age ≤ 60	−0.207***	−0.206***	−0.213***
	(−4.836)	(−4.803)	(−4.960)
Age > 60	−0.024	−0.037	−0.045
	(−0.482)	(−0.742)	(−0.890)
Education attainment (Basic group: < college)			
College	0.173***	0.132***	0.133***
	(5.151)	(3.919)	(3.959)
Bachelor	0.235***	0.162***	0.158***
	(7.347)	(5.001)	(4.879)
Masterate or Doctorate	0.178***	0.096**	0.089**
	(4.180)	(2.229)	(2.069)
Personal Income (Basic group: < 50, thousands CNY)			
50 < Income ≤100	0.193***	0.181***	0.182***
	(6.732)	(6.308)	(6.361)
100 < Income ≤150	0.278***	0.280***	0.284***
	(7.931)	(7.979)	(8.101)
150 < Income ≤500	0.188***	0.187***	0.191***
	(4.535)	(4.505)	(4.598)
Income > 500	0.337***	0.344***	0.349***
	(5.544)	(5.638)	(5.724)
Financial Assets (Basic group: FinAssets < 50, thousands CNY)			
50 < FinAssets ≤100	0.178***	0.163***	0.167***
	(5.385)	(4.932)	(5.050)
100 < FinAssets ≤500	0.252***	0.214***	0.215***
	(7.276)	(6.170)	(6.195)
500 < FinAssets ≤1000	0.584***	0.556***	0.557***
	(13.945)	(13.272)	(13.284)
1000 < FinAssets ≤3000	0.724***	0.697***	0.698***
	(14.696)	(14.147)	(14.166)
FinAssets > 3000	0.828***	0.813***	0.814***
	(13.392)	(13.114)	(13.118)
Investing experience on mutual funds (Basic group: < 12 month)			
12–24 month	0.361***	0.281***	0.274***
	(11.416)	(8.764)	(8.532)
24–60 month	0.637***	0.528***	0.515***
	(18.605)	(15.122)	(14.678)
> 60 month	1.016***	0.874***	0.857***
	(30.614)	(25.474)	(24.807)
Cuto□ point 1 (μ_1)	0.247	0.776***	0.854***
	(1.605)	(4.936)	(5.393)
Cuto□ point 2 (μ_2)	1.596***	2.136***	2.216***
	(10.365)	(13.560)	(13.955)
Cuto□ point 3 (μ_3)	2.759***	3.306***	3.386***
	(17.857)	(20.900)	(21.239)
Cuto□ point 4 (μ_4)	4.273***	4.825***	4.905***
	(27.477)	(30.295)	(30.559)

(*continued on next page*)

and mutual funds investing experience are important predictors of higher investment returns for retail investors. Even after controlling for the demographic characteristics and mutual fund company fixed effects, we find that financial literacy still improves investment performance (Column 2). The coefficient on *Advanced Literacy* is positive with a *t*-statistic of 16.091, indicating that those who display higher literacy are more likely to earn higher returns on mutual fund investments. In the third specification, we also account for *Basic Literacy*. Both the coefficients on *Basic Literacy* and *Advanced Literacy* are positive and highly significant.

The estimates of financial literacy are shown to be sizeable. Table 3 Panel B shows economic effects of financial literacy in the second and the third specification in Panel A. Column (1) shows the marginal effect of *Advanced Literacy* in the second specification. The marginal effects of *Advanced Literacy*—when evaluated at the mean of the independent variables—are −0.012 for major loss, −0.013 for minor loss, −0.001 for roughly breaking even, 0.015 for minor gain, 0.008 for sizeable gain, and 0.003 for significant

percentage points.

A notable finding is that in the third specification, while the coefficients on both *Advanced Literacy* and *Basic Literacy* are positively significant, the coefficient on *Advanced Literacy* is significantly larger than that on *Basic Literacy*. We perform an *F*-test for the difference between the two coefficient estimates and the *F*-value equals 14.44 while the *p*-value is < 0.001. This finding suggests that for Chinese retail investors, advanced financial literacy has a larger impact on reducing higher investment losses than basic financial literacy. Panel B confirms this finding. For example, a one-standard-deviation increase in *Advanced Literacy* (1.958 more correct answers) decreases the probability of an individual investor suffering a major loss on mutual fund investments by approximately 1.940 percentage points (Column 2), while a one-standard-deviation increase in *Basic Literacy* (1.841 more correct answers) decreases the probability of a major loss by 0.718 percentage points (Column 3).

The coefficients on the control variables in Table 3 are mostly consistent with our expectations and convey the expected signs. Mutual fund retail investors with a longer investing history, a higher income, more financial assets, or a higher education level are more likely to earn higher investment returns. Interestingly, younger investors are more likely to perform better. It should be noted that information is an important factor, as being employed or ever having been employed in financial sector relates to a higher investment return. A possible explanation for this result is that individuals that are (or have been) employed in the financial sector may have greater access to relevant information via their connections to asset management specialists or institutional investors, which provides information advantages.

Table 4
Financial literacy and investment performance in mutual fund (Including the measure of risk attitudes and using a subsample)

Panel A: Ordered logit regression estimates

Dependent variable: Investment performance
(1 = major loss, 2 = minor loss, 3 = roughly break even, 4 = minor gain, 5 = sizeable gain, 6 = significant gain)

	Full sample			Subsample		
	(1)	(2)	(3)	(4)	(5)	(6)
Advanced Literacy		0.115***	0.096***		0.133***	0.111***
		(16.720)	(11.807)		(17.219)	(12.258)
Basic Literacy			0.041***			0.047***
			(4.514)			(4.635)
Risk aversion	0.130***	0.146***	0.149***	0.146***	0.155***	0.157***
	(8.393)	(9.382)	(9.600)	(7.676)	(8.115)	(8.239)
Male	0.058***	0.040*	0.041*	0.087***	0.068	0.071
	(2.666)	(1.827)	(1.887)	(3.591)	(1.482)	(1.605)
(Ever) Employed in financial sector	0.118***	0.091***	0.079***	0.171***	0.137***	0.123***
	(4.983)	(3.827)	(3.326)	(6.456)	(5.163)	(4.582)
Age (Basic group: Age < 30)						
30 < Age ≤ 40	−0.201***	−0.206***	−0.212***	−0.209***	−0.212***	−0.218***
	(−6.670)	(−6.839)	(−7.025)	(−6.242)	(−6.316)	(−6.485)
40 < Age ≤ 50	−0.090***	−0.107***	−0.114***	−0.117***	−0.133***	−0.140***
	(−2.716)	(−3.218)	(−3.430)	(−3.110)	(−3.516)	(−3.713)
50 < Age ≤ 60	−0.212***	−0.212***	−0.219***	−0.224***	−0.219***	−0.228***
	(−4.938)	(−4.929)	(−5.107)	(−4.591)	(−4.498)	(−4.671)
Age > 60	−0.036	−0.051	−0.059	−0.119**	−0.131**	−0.139**
	(−0.712)	(−1.010)	(−1.179)	(−2.105)	(−2.324)	(−2.471)
Education attainment (Basic group: < college)						
College	0.169***	0.126***	0.127***	0.194***	0.140***	0.140***
	(5.039)	(3.735)	(3.773)	(5.082)	(3.650)	(3.659)
Bachelor	0.231***	0.154***	0.150***	0.253***	0.159***	0.152***
	(7.230)	(4.772)	(4.627)	(6.996)	(4.356)	(4.168)
Masterate or Doctorate	0.176***	0.090**	0.082*	0.187***	0.081*	0.072
	(4.133)	(2.091)	(1.906)	(3.913)	(1.686)	(1.485)
Personal Income (Basic group: < 50, thousands CNY)						
50 < Income ≤ 100	0.195***	0.183***	0.185***	0.188***	0.176***	0.179***
	(6.819)	(6.390)	(6.453)	(5.935)	(5.552)	(5.644)
100 < Income ≤ 150	0.280***	0.282***	0.287***	0.243***	0.247***	0.253***
	(7.984)	(8.044)	(8.184)	(6.158)	(6.269)	(6.409)
150 < Income ≤ 500	0.186***	0.184***	0.188***	0.198***	0.199***	0.202***
	(4.468)	(4.427)	(4.531)	(4.210)	(4.211)	(4.288)
Income > 500	0.338***	0.346***	0.352***	0.317***	0.310***	0.321***
	(5.546)	(5.656)	(5.756)	(4.297)	(4.204)	(4.340)

(*continued on next page*)

Table 4 (*continued*)

Panel A: Ordered logit regression estimates

Dependent variable: Investment performance
(1 = major loss, 2 = minor loss, 3 = roughly break even, 4 = minor gain, 5 = sizeable gain, 6 = significant gain)

	Full sample			Subsample		
	(1)	(2)	(3)	(4)	(5)	(6)
Financial Assets (Basic group: FinAssets < 50, thousands CNY)						
50 < FinAssets ≤ 100	0.182***	0.167***	0.172***	0.175***	0.156***	0.160***
	(5.507)	(5.045)	(5.180)	(4.704)	(4.180)	(4.295)
100 < FinAssets ≤ 500	0.258***	0.219***	0.220***	0.283***	0.233***	0.233***
	(7.437)	(6.295)	(6.326)	(7.227)	(5.938)	(5.940)
500 < FinAssets ≤ 1000	0.592***	0.564***	0.564***	0.631***	0.599***	0.599***
	(14.115)	(13.429)	(13.446)	(13.395)	(12.698)	(12.701)
1000 < FinAssets ≤ 3000	0.733***	0.706***	0.708***	0.888***	0.856***	0.856***
	(14.847)	(14.293)	(14.319)	(15.627)	(15.054)	(15.047)
FinAssets > 3000	0.841***	0.828***	0.829***	0.989***	0.973***	0.974***
	(13.573)	(13.324)	(13.339)	(13.396)	(13.155)	(13.158)
Investing experience on mutual funds (Basic group: < 12 month)						
12–24 month	0.352***	0.267***	0.259***	0.388***	0.282***	0.271***
	(11.117)	(8.322)	(8.053)	(10.582)	(7.576)	(7.253)
24–60 month	0.641***	0.527***	0.512***	0.728***	0.588***	0.569***
	(18.702)	(15.084)	(14.594)	(18.559)	(14.693)	(14.129)
> 60 month	1.028***	0.881***	0.862***	1.116***	0.940***	0.917***
	(30.900)	(25.622)	(24.909)	(29.303)	(23.866)	(23.102)
Cuto□ point 1 (μ_1)	0.534***	1.119***	1.214***	0.712***	1.351***	1.458***
	(3.389)	(6.934)	(7.461)	(4.325)	(8.016)	(8.571)
Cuto□ point 2 (μ_2)	1.890***	2.487***	2.584***	2.126***	2.783***	2.892***
	(11.965)	(15.364)	(15.822)	(12.881)	(16.432)	(16.912)
Cuto□ point 3 (μ_3)	3.056***	3.660***	3.757***	3.333***	3.999***	4.108***
	(19.275)	(22.513)	(22.908)	(20.104)	(23.487)	(23.899)
Cuto□ point 4 (μ_4)	4.570***	5.179***	5.276***	4.960***	5.632***	5.742***
	(28.652)	(31.654)	(31.967)	(29.692)	(32.820)	(33.141)
Cuto□ point 5 (μ_5)	5.893***	6.502***	6.599***	6.442***	7.116***	7.226***
	(36.503)	(39.286)	(39.533)	(37.917)	(40.797)	(41.044)
Mutual fund company FE	YES	YES	YES	YES	YES	YES
Observations	30,003	30,003	30,003	24,304	24,304	24,304
Pseudo R^2	0.045	0.047	0.048	0.049	0.053	0.053
Chi2 value for F-statistic of AL-BL = 0			13.59***			14.46***

(*continued on next page*)

Table 4 (*continued*)

Panel B: Marginal effects of financial literacy

	(1)		(2)		(3)		(4)		(5)		(6)	
	Marginal effect	Probability increased	Marginal effect	Probability increased	Marginal effect	Probability increased	Marginal effect	Probability increased	Marginal effect	Probability increased	Marginal effect	Probability increased
	Panel A Column (2) Advanced Literacy		Panel A Column (3) Advanced Literacy		Panel A Column (3) Basic Literacy		Panel A Column (5) Advanced Literacy		Panel A Column (6) Advanced Literacy		Panel A Column (6) Basic Literacy	
Major loss	−0.012	−2.388%										

financial literacy to investors' preferred purchasing channels for mutual funds.

5.1. Financial knowledge and trading frequency

Trading in mutual funds incurs transaction costs. Moreover, mutual funds may charge investors a higher percentage fee for the redemptions that follow shortly after the date of purchase (Mahoney, 2004). However, financial economists find that the trading volume of individual investors is disparately large, thus reducing their wealth (Barber and Odean, 2000; Odean, 1999). Barber and Odean (2000) find that individual investors who hold common stocks and trade the most underperform the market. As financial literacy measures individuals' ability to process economic information and make informed decisions (Lusardi and Mitchell, 2014), we expect that more financially literate individuals are more informed of the fact that excessive trading induces higher transaction costs, which a□ects their wealth. They may therefore be less likely to trade as much.

We capture investors' trading frequency by asking the question: "Do you trade very frequently to seize short-run arbitrage opportunities?" Our *Trading frequently* dummy variable takes the value 1 for the 5.1% of the respondents who answered yes, and 0 for the rest. Below, we relate the measure of trading frequency to financial knowledge using the following logistic model, as the dependent variable is binary:

$$\textbf{Trading frequently}_i = \beta \times \textbf{Financial literacy}_i + \gamma X_i + \textbf{s}_i + \varepsilon_i. \quad (6)$$

Table 5 shows the logistic regression results of Eq. (6). Similar to the specifications in subsection 4.2, we use the subsample and include investors' risk attitude in the matrix of controls.[11] Column (1) shows that the coe□cient on *Advanced Literacy* is − 0.127, with a *t*-statistic of − 5.034 and a marginal e□ect of − 0.305%. This means a one-standard-deviation increase in *Advanced Literacy* (1.958 more correct answers) decreases the probability of an individual investor trading very frequently by approximately 0.305 percentage points. As 5.1% of retail investors trade very frequently to seize short-run arbitrage opportunities, this implies an approximate decrease of 6%.

In Column (2), we add the measure for basic literacy. The result shows that the coe□cient on *Advanced Literacy* is − 0.094, with a *t*-statistic of − 3.317. The coe□cient on *Basic Literacy* is − 0.077 with a *t*-statistic of − 2.447. The marginal e□ect of *Advanced Literacy* efore − 0.226%, while the marginal e□ect of *Basic Literacy* is − 0.184%. However, the di□erence between the coe□cients is ficant, as we perform an *F*-test and the *F*-value equals 0.12.

e empirical evidence supports the supposition that more financially literate investors are more likely to avoid trading very ntly, which may help protect their wealth.

inancial knowledge and lack of awareness toward investment charges

our specific setting of mutual fund investments, the issue of investment charges and their reduction are of great importance to ors' realized returns. On the one hand, avoiding high fees is vital for obtaining higher returns (Barber and Odean, 2000). On the hand, investors may find awareness of investment charges in a mutual fund investment setting complicated for the following s: First, there exist a variety of di□erent mutual fund charges across the market (Chordia, 1996; Mahoney, 2004). Second, these es are often not very transparent to mutual fund investors; therefore, avoiding these charges requires sophistication, and ial literacy may play a role in this process (Grinblatt et al., 2016). A lack of awareness toward charges may lead to unnecessary However, financial knowledge enables retail investors to recognize the cost of delegation incurred when partnering with ial intermediaries. We therefore expect that retail investors who are financially savvy are more likely to be aware of investment es in their mutual fund investments.

e capture investors' lack of charge awareness by asking the question: "What do you think of the level of mutual fund charges?" the respondents, 6.8% answered "I do not know the fees and expenses." Our *Lack of charge awareness* dummy variable is set as 1 ese respondents and 0 for the remainder who answered either "much too high," "rather high," or "reasonable." In the following sion analysis, we relate *Lack of charge awareness* to the measures of financial literacy using Eq. (7):

$$\textbf{Lack of charge awareness}_i = \beta \times \textbf{Financial literacy}_i + \gamma X_i + \textbf{s}_i + \varepsilon_i. \quad (7)$$

We report the logistic regression results in Table 6. Column (1) shows that the coe□cient on *Advanced Literacy* is − 0.180, with a *t*-statistic of − 10.283. The marginal e□ect equals − 0.846%. This means a one-standard-deviation increase in *Advanced Literacy* (1.958 more correct answers) decreases the probability of an individual investor lacking awareness of fees by approximately 0.846 percentage points. As 6.8% of the respondents do not know the charges, this implies a 12.4% decrease.

In Column (2), we add the measure for basic literacy. Column (2) shows that the coe□cient on *Advanced Literacy* is − 0.160 with a *t*-statistic of − 7.913, while the coe□cient on *Basic Literacy* is − 0.044 with an insignificant *t*-statistic of − 1.070. The marginal e□ect of *Advanced Literacy* is − 0.751% (an 11% decrease), while the marginal e□ect of *Basic Literacy* is − 0.208% (a 3% decrease). The marginal e□ect of *Advanced Literacy* is more than times that of *Basic Literacy*. It is important to note that the di□erence between the coe□cients is significant, as we perform an *F*-test and the *F*-value equals 9.81. The results indicate that—compared with basic financial knowledge—having more advanced financial knowledge is significantly more important to avoiding fee unawareness in the context of mutual fund investment for Chinese individual investors.

[11] The estimation results using the full sample in Section 4.1 are similar. The same applies to Sections 5.2 and 5.3.

Table 5
Financial literacy and trading frequency.

	(1)		(2)	
	Coe□cient	Marg. E□ect	Coe□cient	Marg. E□ect
Advanced Literacy	−0.127***	−0.305%	−0.094***	−0.226%
	(−5.034)		(−3.317)	
Basic Literacy			−0.077**	−0.184%
			(−2.447)	
Risk aversion	0.057		0.055	
	(1.392)		(1.338)	
Male	0.089		0.087	
	(1.246)		(1.217)	
(Ever) Employed in financial sector	0.100		0.119	
	(1.349)		(1.596)	
Age (Basic group: Age < 30)				
30 < Age ≤ 40	−0.014		−0.007	
	(−0.144)		(−0.077)	
40 < Age ≤ 50	−0.071		−0.058	
	(−0.698)		(−0.574)	
50 < Age ≤ 60	−0.220		−0.212	
	(−1.567)		(−1.508)	
Age > 60	0.209		0.219	
	(1.431)		(1.499)	
Education attainment (Basic group: < college)				
College	−0.058		−0.062	
	(−0.548)		(−0.584)	
Bachelor	−0.148		−0.143	
	(−1.427)		(−1.374)	
Masterate or Doctorate	−0.202		−0.195	
	(−1.434)		(−1.382)	
Personal Income (Basic group: < 50, thousands CNY)				
50 < Income ≤100	−0.072		−0.074	
	(−0.758)		(−0.780)	
100 < Income ≤150	0.199*		0.196*	
	(1.876)		(1.845)	
150 < Income ≤500	0.012		0.008	
	(0.093)		(0.062)	
Income > 500	0.132		0.122	
	(0.843)		(0.776)	
Financial Assets (Basic group: FinAssets < 50, thousands CNY)				
50 < FinAssets ≤100	−0.205*		−0.209*	
	(−1.894)		(−1.926)	
100 < FinAssets ≤500	−0.034		−0.028	
	(−0.312)		(−0.259)	
500 < FinAssets ≤1000	0.055		0.056	
	(0.441)		(0.445)	
1000 < FinAssets ≤3000	0.004		0.003	
	(0.025)		(0.019)	
FinAssets > 3000	0.498***		0.496***	
	(3.195)		(3.182)	
Investing experience on mutual funds (Basic group: < 12 month)				
12–24 month	0.094		0.099	
	(0.976)		(1.031)	
24–60 month	0.009		0.028	
	(0.083)		(0.264)	
> 60 month	−0.180*		−0.151	
	(−1.701)		(−1.416)	
Mutual fund company FE	YES		YES	
Observations	22,332		22,332	
Pseudo R^2	0.179		0.178	
Chi2 value for F-statistic of AL-BL = 0			0.12	

This table relies on a sample of individual investors in mutual funds in China. We relate individual investors' trading frequency on mutual funds to their financial literacy. The main variable of interest, “Financial literacy” takes the value on the total number of correct answers that an investor gave, out of the 13 designed questions. The dependent variable is “Trade frequently,” a dummy variable measured by focusing on the question: “Do you trade very frequently to seize short-run arbitrage opportunities?” Our *Trading frequently* dummy takes the value 1 for the 5.1% of the respondents who answered yes, and 0 otherwise. The column “Marginal E□ect” reports the marginal e□ect of the measures of trading frequently, computed at the average value of the other RHS variables. The table uses a subsample that consists of the respondents who tailor their investment

style to their risk preferences. The estimation results using the full sample are similar. T-statistics are reported in parentheses. *** indicates the coe□cient is di□erent from zero at the 1% level, ** at the 5% level, and *at the 10% level. All are logistic estimates with mutual fund company fixed e□ect controlled.

In summary, the results in Table 6 support our assumption that higher levels of financial knowledge are associated with higher investment charge awareness. Moreover, the results also suggest that more advanced financial knowledge play a more pronounced role than basic financial knowledge.

5.3. Financial knowledge and preferred purchase channel for mutual funds

Next, we focus on a specific type of expense typically incurred in mutual fund investments: distribution channel fees. Bergstresser et al. (2009) point out that numerous investors purchase broker-sold funds and pay for this fund selection service. However, relative to direct-sold funds, broker-sold funds deliver lower risk-adjusted returns, even before accounting for distribution costs due to conflicts of interests. This suggests that—holding other things equal—investors purchasing direct-sold funds may earn higher realized returns. Following Grinblatt et al. (2016), who find that investors with higher cognitive abilities tend to invest in low-fee funds, we presume that financially literate investors are also more likely to purchase funds through direct channels instead of indirect ones. Within China's context, we expect that the financially literate will have a tendency to buy mutual fund shares from mutual fund companies and would be less likely to purchase bank-sold funds.

We use the distribution categories introduced by Bergstresser et al. (2009): direct-sold funds that are marketed directly by the fund company to the retail consumer and broker-sold funds distributed by an intermediary. We identify the respondents' favored purchase channel by using the following question: “From which of the following distribution channels do you usually purchase funds?” We then construct two dummy variables to indicate the investors' choice: one for direct-sold and one for broker-sold channels. Our *Direct-sold funds* dummy takes the value 1 for the 38.8% of respondents who answered, “Through the mutual fund company,” and 0 for the others. The *Bank-sold funds* dummy takes the value of 1 for the 26.3% of respondents who answered, “Through a commercial bank” and to 0 for the rest. We relate the dummies indicating fund purchase channels to investors' financial literacy using the following empirical model:

$$\textbf{Purchase channel}_i = \beta \times \textbf{Financial literacy}_i + \gamma X_i + s_i + \varepsilon_i, \tag{8}$$

where *Purchase channel* can be either *Direct-sold funds* or *Bank-sold funds.*

The logistic regression results of Eq. (8) are shown in Table 7. Panel A reports the results in which *Direct-sold funds* is the dependent variable. Column (1) shows that the coe□cient on *Advanced Literacy* is 0.126 with a *t*-statistic of 13.121. The marginal e□ect equals 2.902%. As 38.8% of the respondents buy funds mainly from this direct-sold channel, this implies an increase of approximately 7.5%.

In Panel A, Column (2), we add the measure for basic literacy to account for the e□ects of the di□erent categories of financial literacy. The coe□cient on *Advanced Literacy* is 0.125 with a *t*-statistic of 11.174, while the coe□cient on *Basic Literacy* is 0.001 with an insignificant *t*-statistic of 0.081. The marginal e□ect of *Advanced Literacy* is 2.891% (a 7.5% increase), while the marginal e□ect of *Basic Literacy* is 0.024% (a 0.06% increase). The marginal e□ect of *Advanced Literacy* is > 100 times larger than that of *Basic Literacy.* Importantly, the di□erence between the coe□cients is significant, as we perform an *F*-test and the *F*-value equals to 35.95. The results provide strong evidence that, relative to basic literacy, advanced knowledge concerning financial markets matters more for choosing a low-fee channel.

Panel B of Table 7 shows the results for bank-sold funds. Column (1) shows that the coe□cient on *Advanced Literacy* is − 0.143, with a t-statistic of − 14.205. The marginal e□ect equals − 2.722%. As 26.3% of the respondents buy funds mainly from this indirect-sold channel, this implies a 10.3% decrease.

Column (2) shows the results of adding the measure for basic literacy to account for the e□ects of di□erent categories of financial literacy. The coe□cient on *Advanced Literacy* is − 0.167 with a *t*-statistic of − 14.148, with the magnitude becoming even larger after controlling for *Basic Literacy.* The coe□cient on *Basic Literacy* is 0.053, with a *t*-statistic of 3.927. The marginal e□ect of *Advanced Literacy* is − 3.184% (a 12.1% decrease), while the marginal e□ect of *Basic Literacy* is 1.008% (a 3.8% increase). The di□erence between the coe□cients is highly significant, as the *F*-value equals 99.24. The coe□cient estimate of *Basic Literacy* shows an opposite sign to that of *Advanced Literacy*. We also notice that basic literacy reflects more knowledge concerning basic economic concepts, while advanced literacy focuses more on the functioning of financial markets. The patterns of *Advanced Literacy* and *Basic Literacy* are somewhat similar to those discovered by Brown et al. (2016). They find that, while financial and mathematical education improves repayment behavior, economic training increases the prevalence of repayment di□culties. These findings provide strong evidence that, relative to basic literacy, advanced knowledge concerning financial markets matters more for choosing a low-fee channel. In summary, the estimation results provided in Table 7 support our assumption that the more financially literate an investor is, the more likely they are to prefer low-fee channels to purchase mutual funds. In particular, the results suggest that relative to basic literacy, advanced knowledge about financial markets play a more important role.

It is important to note that, in most cases in this section, information access is positively related with retail investors' sophistication concerning investment charges. For example, investors who are employed or have ever been employed in the financial industry are less likely to lack awareness of investment charges, are more likely to purchase mutual funds via direct channels, and are less likely to use indirect channels. These findings suggest that information access plays a significant role in retail investors' financial welfare. In this paper, we capture information access using retail investor's employment in the finance industry. However, we

Table 6
Financial literacy and lack of charge awareness.

	(1)		(2)	
	Coe□cient	Marg. E□ect	Coe□cient	Marg. E□ect
Advanced Literacy	−0.180***	−0.846%	−0.160***	−0.751%
	(10.283)		(−7.913)	
Basic Literacy			−0.044	−0.208%
			(−1.070)	
Risk aversion	0.263***		0.262***	
	(7.629)		(7.587)	
Male	−0.201***		−0.204***	
	(−3.685)		(−3.733)	
(Ever) Employed in financial sector	−0.416***		−0.428***	
	(−6.857)		(−7.027)	
Age (Basic group: Age < 30)				
30 < Age ≤ 40	0.076		0.082	
	(1.005)		(1.096)	
40 < Age ≤ 50	0.014		0.022	
	(0.165)		(0.274)	
50 < Age ≤ 60	−0.103		−0.094	
	(−0.936)		(−0.858)	
Age > 60	0.156		0.164	
	(1.317)		(1.380)	
Education attainment (Basic group: < college)				
College	−0.249***		−0.251***	
	(−3.058)		(−3.079)	
Bachelor	−0.240***		−0.236***	
	(−3.083)		(−3.032)	
Masterate or Doctorate	−0.366***		−0.359***	
	(−3.343)		(−3.279)	
Personal Income (Basic group: < 50, thousands CNY)				
50 < Income ≤100	−0.161**		−0.162**	
	(−2.271)		(−2.290)	
100 < Income ≤150	−0.132		−0.137	
	(−1.529)		(−1.592)	
150 < Income ≤500	−0.175*		−0.179*	
	(−1.680)		(−1.722)	
Income > 500	0.313**		0.304**	
	(2.393)		(2.327)	
Financial Assets (Basic group: FinAssets < 50, thousands CNY)				
50 < FinAssets ≤100	−0.103		−0.105	
	(−1.312)		(−1.339)	
100 < FinAssets ≤500	−0.338***		−0.334***	
	(−3.978)		(−3.938)	
500 < FinAssets ≤1000	−0.421***		−0.420***	
	(−4.081)		(−4.067)	
1000 < FinAssets ≤3000	−0.246**		−0.246**	
	(−2.101)		(−2.101)	
FinAssets > 3000	−0.516***		−0.517***	
	(−3.407)		(−3.412)	
Investing experience on mutual funds (Basic group: < 12 month)				
12–24 month	0.114		0.121	
	(1.476)		(1.560)	
24–60 month	0.144*		0.158*	
	(1.688)		(1.848)	
> 60 month	0.106		0.124	
	(1.267)		(1.479)	
Mutual fund company FE	YES		YES	
Observations	23,640		23,640	
Pseudo R^2	0.105		0.105	
Chi2 value for F-statistic of AL-BL = 0			9.81***	

This table relies on a sample of individual investors on mutual fund in China. We relate individual investors' investment charge unawareness to their financial literacy. The dependent variable is a dummy variable. We measure it using the following questions: "What do you think of the level of mutual fund charges?" The dependent variable, *Charge Unawareness* is set to 1 for the 6.8% of respondents who answered "I do not know the fees and expenses" 0 for the remainder who answered either "much too high," "rather high," or "reasonable." The column headed "Marginal E□ect" reports

the marginal effect of the measures of financial knowledge, computed at the average value of the other RHS variables. The table uses the subsample that consists of respondents who tailor their investment style to their risk attitudes. The estimation results using the full sample are similar. T-statistics are reported in parentheses. *** indicates the coefficient is different from zero at the 1% level, ** at the 5% level, and *at the 10% level. All are logistic estimates with mutual fund company fixed effect controlled.

Table 7
Financial literacy and the preferred purchase channel of funds.

Panel A: Financial literacy and preference for direct channels

	(1)		(2)	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Advanced Literacy	0.126***	2.902%	0.125***	2.891%
	(13.121)		(11.174)	
Basic Literacy			0.001	0.024%
			(0.081)	
Risk aversion	0.089***		0.089***	
	(3.780)		(3.781)	
Male	−0.020		−0.019	
	(−0.650)		(−0.648)	
(Ever) Employed in financial sector	0.099***		0.098***	
	(3.033)		(3.004)	
Investing experience on mutual funds (Basic group: < 12 month)				
12–24 month	0.116**		0.116**	
	(2.464)		(2.451)	
24–60 month	0.112**		0.112**	
	(2.251)		(2.227)	
> 60 month	0.192***		0.191***	
	(4.002)		(3.952)	
Personal Income (Basic group: < 50, thousands CNY)				
50 < Income ≤ 100	0.133***		0.133***	
	(3.404)		(3.404)	
100 < Income ≤ 150	0.139***		0.139***	
	(2.879)		(2.880)	
150 < Income ≤ 500	0.197***		0.197***	
	(3.471)		(3.472)	
Income > 500	0.406***		0.407***	
	(4.718)		(4.718)	
Financial Assets (Basic group: FinAssets < 50, thousands CNY)				
50 < FinAssets ≤ 100	0.106**		0.106**	
	(2.260)		(2.261)	
100 < FinAssets ≤ 500	0.136***		0.136***	
	(2.801)		(2.800)	
500 < FinAssets ≤ 1000	0.055		0.055	
	(0.968)		(0.968)	
1000 < FinAssets ≤ 3000	−0.014		−0.014	
	(−0.203)		(−0.203)	
FinAssets > 3000	−0.064		−0.064	
	(−0.731)		(−0.732)	
Age (Basic group: Age < 30)				
30 < Age ≤ 40	0.084**		0.084**	
	(2.015)		(2.010)	
40 < Age ≤ 50	0.097**		0.097**	
	(2.081)		(2.076)	
50 < Age ≤ 60	0.103*		0.103*	
	(1.746)		(1.741)	
Age > 60	−0.042		−0.043	
	(−0.619)		(−0.621)	
Education attainment (Basic group: < college)				
College	0.284***		0.284***	
	(5.884)		(5.884)	

(*continued on next page*)

Table 7 (*continued*)

Panel A: Financial literacy and preference for direct channels

	(1)		(2)	
	Coe□cient	Marginal E□ect	Coe□cient	Marginal E□ect
Bachelor	0.460***		0.460***	
	(10.078)		(10.069)	
Masterate or Doctorate	0.349***		0.349***	
	(5.911)		(5.904)	
Mutual fund company FE	YES		YES	
Observations	24,268		24,268	
Pseudo R^2	0.094		0.094	
Chi2 value for F-statistic of AL-BL = 0			35.95***	

Panel B: Financial literacy and preference for indirect channels: bank-sold funds

	(1)		(2)	
	Coe□cient	Marginal E□ect	Coe□cient	Marginal E□ect
Advanced Literacy	−0.143***	−2.722%	−0.167***	−3.184%
	(−14.205)		(−14.148)	
Basic Literacy			0.053***	1.008%
			(3.927)	
Risk aversion	−0.135***		−0.133***	
	(−5.542)		(−5.444)	
Male	−0.172***		−0.169***	
	(−5.382)		(−5.261)	
(Ever) Employed in financial sector	−0.106***		−0.121***	
	(−3.032)		(−3.455)	
Investing experience on mutual funds (Basic group: < 12 month)				
12–24 month	−0.336***		−0.350***	
	(−6.455)		(−6.693)	
24–60 month	−0.055		−0.078	
	(−1.036)		(−1.442)	
> 60 month	0.070		0.044	
	(1.376)		(0.846)	
Personal Income (Basic group: < 50, thousands CNY)				
50 < Income ≤ 100	−0.136***		−0.133***	
	(−3.294)		(−3.233)	
100 < Income ≤ 150	−0.133***		−0.129**	
	(−2.608)		(−2.529)	
150 < Income ≤ 500	−0.226***		−0.222***	
	(−3.658)		(−3.592)	
Income > 500	−0.287***		−0.277***	
	(−2.931)		(−2.828)	
Financial Assets (Basic group: FinAssets < 50, thousands CNY)				
50 < FinAssets ≤ 100	−0.309***		−0.307***	
	(−6.284)		(−6.248)	
100 < FinAssets ≤ 500	−0.249***		−0.253***	
	(−4.847)		(−4.918)	
500 < FinAssets ≤ 1000	−0.278***		−0.281***	
	(−4.549)		(−4.600)	
1000 < FinAssets ≤ 3000	−0.247***		−0.249***	
	(−3.408)		(−3.430)	
FinAssets > 3000	−0.333***		−0.333***	
	(−3.442)		(−3.445)	
Age (Basic group: Age < 30)				
30 < Age ≤ 40	0.392***		0.384***	
	(8.379)		(8.206)	
40 < Age ≤ 50	0.496***		0.487***	
	(9.645)		(9.464)	
50 < Age ≤ 60	0.755***		0.745***	
	(11.991)		(11.806)	
Age > 60	0.848***		0.840***	
	(11.915)		(11.788)	

(*continued on next page*)

acknowledge that some other proxies—for example political connections, company or organization a□liation, and place of work or residence—may also provide some level of advantage in terms of information access, which could also influence retail investors' financial welfare. We highlight this aspect of our study as an interesting and important area for future research, particularly if more data concerning retail investors' information access become available.

6. Conclusion

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Appendix

Basic Literacy Questions

1. Suppose you had ￥1000 and you are supposed to distribute the money to five persons equally. How much do you think each person would get? (i) ￥180; (ii) ￥190; (iii) ￥200; (iv) ￥210; (v) Do not know."
2. One-year deposit interest rate: What is your estimation of one-year deposit interest rate?(i) < 1%; (ii) 1–5%; (iii) 5–10%; (iv) 10% or above; (v) Do not know.
3. Interest calculation: Suppose you had ￥10,000 in a savings account and the interest rate is 3% per year. After 1 year, how much would you have in this account in total? (i) Exactly ￥10,300; (ii) More than ￥10,300; (iii) Less than ￥10,300; (iv) Do not know.
4. Interest compounding: Suppose you had ￥10,000 in a savings account and the interest rate is 3% per year and you never withdraw money or interest payments. After 2 years, how much would you have on this account in total? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) Do not know.
5. Inflation: Imagine that the interest rate on your savings account was 1% per year and the inflation rate was 2% per year. After 1 year, how much would you be able to buy with the money in this account? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) Do not know.
6. Time value of money: Assume a friend inherits ￥100,000 today and his sibling inherits ￥100,000 3 years from now. Who is richer because of the inheritance? (i) My friend; (ii) His sibling; (iii) They are equally rich; (iv) Do not know.

Advanced Literacy Questions

7. Central Bank: In China, which bank undertakes the responsibility of establishing the monetary policy? (1) Bank of China; (2) Industry and Commerce Bank of China; (3) People's Bank of China; (4) China Construction Bank; (9) Do not know.
8. Risk and Return: An investment vehicle with a higher return is likely to be of higher risk. (i) True; (ii) False; (iii) Do not know.
9. Diversification: To buy a single share carries less risk than buying shares in mutual funds. (i) True; (ii) False; (iii) Do not know.
10. Risk: Which asset normally gives the highest return? (i) Savings account; (ii) Bonds; (iii) Stocks; (iv) Mutual funds; (v) Do not know.
11. Stocks: Which of the following statements are correct? If someone buys the stock of firm B in the stock market: (i) He/She has lent money to firm B; (ii) He/She owns part of firm B; (iii) He/She owns part of firm B if he/she holds the stock for a long time, and he/she has lent money to firm B if only holds the stock for a short time; (iv) None of the above; (v) Do not know.
12. Mutual funds: Which of the following statements are correct? (i) Mutual funds with lower net worth will have higher performance in the future; (ii) Mutual funds can invest in several assets, for example invest in both stocks and bonds; (iii) Mutual funds pay a guaranteed rate of return, which depends on their past performance; (iv) None of the above; (v) Do not know.
13. Stock markets: Which of the following statements describe the main function of the stock market? (i) The stock market helps to predict stock earnings; (ii) The stock market results in an increase in the price of stocks; (iii) The stock market brings people who want to buy stocks together with those who want to sell stocks; (iv) None of the above; (v) Do not know.

References

Atkinson, A., Messy, F., 2012. Measuring financial literacy: Results of the OECD/International Network on Financial Education (INFE) pilot study. In: OECD Working Papers on Finance, Insurance and Private Pensions, 15. OECD Publishing, Paris.
Bailey, W., Kumar, A., Ng, D., 2011. Behavioral biases of mutual fund investors. J. Financ. Econ. 102 (1), 1–27.
Barber, B.M., Odean, T., 2000. Trading is hazardous to your wealth: the common stock investment performance of individual investors. J. Financ. 55 (2), 773–806.
Barber, B.M., Odean, T., 2001. Boys will be boys: gender, overconfidence, and common stock investment. Quart. J. Econ. 116 (1), 261–292.
Bergstresser, D., Chalmers, J.M.R., Tufano, P., 2009. Assessing the costs and benefits of brokers in the mutual fund industry. Rev. Financ. Stud. 22 (10), 4129–4156.
Brown, M., Grigsby, J., Van der Klaauw, W., Wen, J., Zafar, B., 2016. Financial education and the debt behavior of the young. Rev. Financ. Stud. 29 (9), 2490–2522.
Cao, Q., 2016. Reports of Mutual Funds and Hedge Funds in China 2016. Economic. Science Press.
Chordia, T., 1996. The structure of mutual fund charges. J. Financ. Econ. 41 (1), 3–39.
Collins, J.M., 2012. Financial advice: a substitute for financial literacy? Financ. Serv. Rev. 21 (4), 307–322.
French, K.R., 2008. Presidential address: the cost of active investing. J. Financ. 63 (4), 1537–1573.
Grinblatt, M., Ikäheimo, S., Keloharju, M., Knüpfer, S., 2016. IQ and mutual fund choice. Manag. Sci. 62 (4), 924–944.
Gruber, M.J., 1996. Another puzzle: the growth in actively managed mutual funds. J. Financ. 51 (3), 783–810.
Inderst, R., Ottaviani, M., 2012. Financial advice. J. Econ. Lit. 50 (2), 494–512.
Kim, H.H., Maurer, R., Mitchell, O.S., 2016. Time is money: rational life cycle inertia and the delegation of investment management. J. Financ. Econ. 121, 427–447.
Liao, L., Zhang, X., Zhang, Y., 2017. Mutual fund managers' timing abilities. Pac. Basin Financ. J. 44 (9), 80–96.
Lusardi, A., Mitchell, O.S., 2007a. Financial literacy and retirement preparedness: evidence and implications for financial education. Bus. Econ. 42 (1), 35–44.
Lusardi, A., Mitchell, O.S., 2007b. Baby boomer retirement security: the roles of planning, financial literacy, and housing wealth. J. Monet. Econ. 54 (1), 205–224.
Lusardi, A., Mitchell, O.S., 2014. The economic importance of financial literacy: theory and evidence. J. Econ. Lit. 52 (1), 5–44.
Lusardi, A., Tufano, P., 2009. Debt Literacy, Financial Experiences, and Overindebtedness. Working paper no. w14808. National Bureau of Economic Research.

Mahoney, P.G., 2004. Manager-investor conflicts in mutual funds. J. Econ. Perspect. 18 (2), 161–182.
McElvey, W., Zavoina, R., 1975. A statistical model for the analysis of ordinal level dependent variables. J. Math. Sociol. 4 (1), 103–120.
Odean, T., 1999. Do investors trade too much? Am. Econ. Rev. 89 (5), 1279–1298.
Seru, A., Shumway, T., Sto□man, N., 2010. Learning by trading. Rev. Financ. Stud. 23 (2), 705–739.
Titman, S., Wei, C., Zhao, B., 2017. Corporate Actions and the Manipulation of Retail Investors in China. Working paper available at SSRN. https://ssrn.com/abstract=2924728.
Van Rooij, M., Lusardi, A., Alessie, R., 2011. Financial literacy and stock market participation. J. Financ. Econ. 101 (2), 449–472.
Van Rooij, M., Lusardi, A., Alessie, R., 2012. Financial literacy, retirement planning and household wealth. Econ. J. 122 (560), 449–478.
Von Gaudecker, H.M., 2015. How does household portfolio diversification vary with financial literacy and financial advice? J. Financ. 70 (2), 489–507.
Willis, L.E., 2011. The financial education fallacy. Am. Econ. Rev. 101 (3), 429–434.
Winship, C., Mare, R.D., 1984. Regression models with ordinal variables. Am. Socio. Rev. 49 (8), 515–525.
Xie, Y., Hu, J., 2014. An introduction to the China family panel studies (CFPS). Chin. Socio. Rev. 47 (1), 3–29.
Xiong, W., Yu, J., 2011. The Chinese warrants bubble. Am. Econ. Rev. 101 (10), 2723–2753.
Zheng, L., 1999. Is money smart? A study of mutual fund investors' fund selection ability. J. Financ. 54 (3), 901–933.