



HOUSEHOLD LEVERAGE AND STOCK MARKET INVESTMENT DECISIONS



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ABSTRACT

Article History

Received: 28 September 2018

Revised: 6 November 2018

Accepted: 3 December 2018

Published: 31 December 2018

Keywords

Household leverage

Household finance

Stock market participation

Financing constraint

Risk aversion

Individual behavior

JEL Classification:

D10, D91, G41

Household leverage has significant influence on their stock market investment decisions, controlling for age, gender, wealth, income, education background, and financial experience. Using a unique survey data in China, we provide evidence that individuals with higher household leverage are less likely to participate on the stock market. However, for stock market participators, higher household leverage is associated with higher investment rate on stocks and mutual funds. We further examine the underlying mechanisms by financial constraint and risk aversion. Financial constraint cannot explain the effect of leverage on respondents' stock market participation, but is a good moderator variable for the influence of leverage on participators' stock investment rate. The enhancement effect of leverage on the stock investment rate is stronger for the stock market participators when they face less severe financial constraint. Risk preference can help explain the household leverage effect. The impediment effect of household leverage on stock market participation only works when they are strongly risk averse while the enhancement effect of household leverage on stock investment rate only works when participators are slightly risk averse.

Contribution/ Originality: This paper contributes to the existing studies on household finance, especially for the correlation between leverage and stock market investment decisions. Financial constraint helps explain, but does not subsume, the leverage effect. However, risk aversion plays a key role in the influence of leverage on stock market investment decisions.

1. INTRODUCTION

Household behavior is difficult to measure since household faces constraints not captured by textbooks (Campbell, 2006). Stock market is vital for households since it could satisfy their demand of risky investment. To the best of our knowledge, there is less consensus on how households allocate their investment on the stock market. Their stock market investment decisions may be complicated considering their wealth, income, age, education background, financial literacy, and so on. Related mechanisms have been explored in research by Basak and Cuoco (1998); Hong *et al.* (2004); Barberis *et al.* (2006); Rooij *et al.* (2011); Grinblatt *et al.* (2011); Almenberg and Dreber (2015) among others.

Household leverage refers to the fact that families are usually indebted and obligated to repay their debts in the future. Families in heavy debt will have a large cash outflow in the future, which requires them to do precautionary savings or make sure that there will be enough cash inflow before the due date. Otherwise, it'll cause financial distress to these families. Therefore, household leverage may influence their willingness to invest on risky assets, like the stock market. To be clear, our household leverage measure (*Leverage*) is defined as the ratio of total debt to total asset.

In this paper, we aim to investigate whether and how families' stock market investment decisions are influenced by their household leverage. A vast and growing literature focus on firm's capital structure while little focus on the household leverage. We use a unique survey data set in China to do empirical tests. There are two variables related to respondents' stock market investment decisions. The first variable is stock market participation which is measured by the dummy variable *Stockpar*. Investors could invest on stock market by either holding individual stocks or holding mutual funds. The dummy variable *Stockpar* equals one if the sum of the respondent's stock holdings and mutual fund holdings is nonzero. The second variable is the investment on stock market relative to the total investment of participators. Stock market participators are the respondents with *Stockpar* equaling to one. For the stock market participators, the variable *Stockratio* which is defined as the ratio of stock and mutual fund holdings to the total financial assets, measures the investment rate on stock market.

To study the effects of household leverage on their stock market investment decisions. We first run probit regressions of *Stockpar* on *Leverage* for all respondents, controlling for the well-known factors which have been proved to be correlated to stock market participation. We find that household leverage has an impediment effect on stock market participation which is economically and statistically significant, meaning that respondents with high leverage are less likely to participate on the stock market.

Second, we use OLS regression of *Stockratio* on *Leverage* for all stock market participators. The control variables are included in each regression. We find that, for stock market participators, higher household leverage is associated with higher investment rate on stocks and mutual funds. It indicates that investors who are more indebted are investing more on risky assets, consistent with the moral hazard hypothesis in the literature.

We then examine the underlying mechanisms of the influence of household leverage on stock market investment decisions. One of the potential mechanism is attributed to financial constraint. We measure households' financial constraint by their ability to borrow money when they are short of liquidity. Households with high leverage are more likely to suffer financial distress if they face more severe financial constraint. Therefore, financial constraint together with household leverage may have an effect on their stock market investment decisions since investing on stock market is risky. We redo the probit and OLS regressions in different groups sorted by financial constraint variable, *Constraint*. The empirical results show us that financial constraint cannot help explain the impediment effect of leverage on stock market participation. However, financial constraint is a good moderating variable for the effect of leverage on participators' stock investment rate. The enhancement effect of leverage on the stock investment rate is stronger for the stock market participators when they face less severe financial constraint.

An alternative mechanism is the risk preference. According to the Markowitz's Two-Fund Separation Theorem, individuals' investment on risky assets is determined by their risk preference. Besides, the conservative individuals are also less likely to hold heavy debt because high leverage increases the investment risk and liquidity risk. As a result, the influence of household leverage on stock market investment decisions might simply result from their risk aversion. Similar to the empirical analysis on financial constraint, we redo the probit and OLS regressions in different groups sorted by risk aversion variable, *Riskaver*. We find that risk preference can help explain the household leverage effect. On the one hand, the impediment effect of household leverage on stock market participation only works when they are strongly risk averse. On the other hand, the enhancement effect of household leverage on stock investment rate only works when participators are slightly risk averse.

This paper is related to two strands of literature. Firstly, this paper enriches the research on households' stock market investment decisions. In previous decades, a lot of studies tried to investigate the factors which influence the stock market investment decisions of households. Some focused on the effect of cognitive abilities on individual's participation in stock market. Grinblatt *et al.* (2011) found that stock market participation is monotonically related to IQ. High-IQ investors are more likely to hold mutual funds and diversified portfolio of stocks. Besides the instinctive abilities, families' education background and finance experience may also play a key role on stock market participation. Rooij *et al.* (2011) found that the majority of respondents to survey display basic financial knowledge and very few go beyond basic concepts. In addition, they found that respondents with low financial literacy are much less likely to invest in stocks. There are also papers studying the peer effect on individuals' stock market participation. In an early paper, Hong *et al.* (2004) found that stock market participation is influenced by social interaction. Investors will find stock market more attractive when more of their peers participate. Given similar idea, Brown *et al.* (2008) studied the causal relation between an individual's decision to own stocks and average stock market participation of the individual's community. They provided evidence of causal community effects in the context of stock market participation. In addition, Kaustia and Knüpfer (2012) presented evidence that recent stock returns which local peers experienced affect an individual's stock market entry decision, especially in areas with better opportunities for social learning. We contribute to this strand of literature by including household leverage as a factor which influences their stock market investment decisions.

We are also correlated to another strand of research which focuses on the capital structure. It stems from the seminal research in Modigliani and Miller (1958;1963). Most theoretical and empirical studies of capital structure focus on the public firms and a limited number of studies focus on small and medium size enterprises. Little of this flow of research studies the families' capital structure which refers to the household leverage in this paper. We contribute to the literature by providing evidence for the fact that leverage could influence individuals' stock market investment decisions, which means that leverage has an effect on individuals' willingness to invest on risky assets. It could be applied to the studies in behavioral finance which aim to investigate the individual's risk-taking decisions, and to the studies in corporate finance which investigate the behavior of corporate managers, especially for the managers in family firms.

The remainder of this paper is outlined as follows. Section 2 describes the data and summary statistics. Section 3 reports the probit and OLS regressions which study the effects of household leverage on stock market investment decisions. Section 4 examines the underlying mechanisms by financial constraint and risk aversion. Section 5 concludes.

2. DATA AND SUMMARY STATISTICS

We collect data from China Center of Financial Research's household survey in 2012. The survey was funded by National Natural Science Foundation of China (NNSFC, 71232002), Citibank and Taian City Commercial bank. It randomly surveyed thousands of citizens among 24 cities, about their family characteristics, assets, income, debt, expenditure, consumption, cognitive and non-cognitive abilities, and other status. There are 3,122 respondents in total who provided valid answers. These respondents are from 25 years old to 78 years old. The city in this data set covers first-tier cities, second-tier cities, and third-tier cities. Besides, there are at least 60 respondents and at most 300 respondents in each city. Overall, the data set in this paper is an approximately representative sample of Chinese citizens.

The key explained variable in this paper is the measure of individuals' stock market investment. There are two ways to study the individuals' stock market investment. The first way is stock market participation. Investors could invest on stock market by either holding individual stocks or holding mutual funds. The dummy variable *Stockpar* equals one when the sum of the respondent's stock holdings and fund holdings is nonzero, which means that the respondent is a stock market participator. The second way is the investment on stock market relative to the total

investment of participators. For the stock market participators, the variable *Stockratio* measures the investment rate on stock market, which is defined as the ratio of stock and mutual fund holdings to the total financial assets. Financial assets include cash holdings, stock holdings, mutual fund holdings, bond holdings, deposits, lending, and saving insurance. Participators' stock investment rate is a good indicator of their preference to risky assets. The key explanatory variable is household leverage, *leverage*, which is defined as the ratio of total debt to total asset. Debt includes house loans, car loans, and credit loans.

In order to further examine the underlying mechanisms of the household leverage on stock market investment, we analyze the moderating role of financial constraint and risk aversion. The respondents' financial constraint is measured by the question in the survey: "How hard is it for your family to borrow a loan of 100,000 RMB for one year?" The variable *constraint* equals one for the answer of "Very Easy", two for the answer of "Easy", three for the answer of "Normal", four for the answer of "Hard", and five for the answer of "Very Hard". The larger value of variable *constraint* stands for more severe financial constraint. The respondents' risk aversion is measured by the question in the survey: "What kind of risk would you like to take when making an investment?" There are also five categories of answers. The variable *Riskaver* equals one for the answer of "I'd like to take very high risk for very high returns", two for the answer of "I'd like to take high risk for high returns", three for the answer of "I just want to take average-level risk for average-level returns", four for the answer of "I can only take low risk for low returns", and five for the answer of "I wouldn't like to take any risk". The larger is the variable *Riskaver*, the higher is the risk aversion of respondents.

In our analysis of household leverage on stock market investment decisions, we also control well-known variables related to stock market investment, including respondents' age, gender, education background, financial education experience, family wealth, and monthly income. To be more accurate and clear, respondents' wealth is calculated as sum of financial assets, house assets and other assets.

Table-1. Variable Definitions and Summary Statistics

Panel A provides variable definitions and Panel B reports summary statistics for the main variables. The data is from China Center of Financial Research's household survey in 2012. All variables are winsorized at the 1% and 99% level.

Panel A: Variable Definitions	
Variable	Definition
<i>Stockpar</i>	Dummy variable, equals one if the respondents hold stocks or mutual funds and equals zero otherwise.
<i>Stockratio</i>	The ratio of stock and mutual fund holdings to the total financial assets. Financial assets include cash holdings, stock holdings, mutual fund holdings, bond holdings, deposits, lending, and saving insurance.
<i>Leverage</i>	The leverage of respondents which is defined as the ratio of debt to total asset. Debt includes house loans, car loans, and credit loans.
<i>Riskaver</i>	The risk-aversion level of respondents which is integer between one and five. Higher value means higher risk-aversion level.
<i>Constraint</i>	The financial constraint level of respondents which is integer between one and five. Higher value means lower financial constraint because the respondents can borrow money more easily.
<i>Age</i>	The age of respondents.
<i>Gender</i>	The gender of respondents. Equals zero for females and equals one for males.
<i>Education</i>	The educational level of respondents which is integer between one and four, higher value means higher educational level. Equals one if the respondent has junior high school degree or lower, equals two if the respondent has senior high school degree, equals three if the respondent has bachelor degree, and equals four if the respondent has master degree or above.
<i>Financeedu</i>	Dummy variable, equals one if respondents have economic or financial education experience.
<i>Wealth</i>	The total asset (RMB) of respondents, including financial assets, house assets, commercial assets, consumption assets, and other assets.
<i>Income</i>	The monthly income (RMB) of respondents.

Panel B: Summary Statistics						
Variable	N	Mean	Std	Min	Median	Max
<i>Stockpar</i>	3,122	0.50	0.50	0	1	1
<i>Stockratio</i>	1,562	0.31	0.19	0.03	0.28	0.88
<i>Leverage</i>	3,122	0.16	0.18	0	0.10	0.96
<i>Riskaver</i>	3,122	3.10	1.06	1	3	5
<i>Constraint</i>	3,122	2.68	0.92	1	3	5
<i>Age</i>	3,122	34.24	7.63	25	33	78
<i>Gender</i>	3,122	0.71	0.45	0	1	1
<i>Education</i>	3,122	2.98	0.53	1	3	4
<i>Financeedu</i>	3,122	0.74	0.44	0	1	1
<i>Wealth</i> (10 ³)	3,122	1,729.12	1,498.18	80.00	1,311.00	8,262.00
<i>Income</i> (10 ³)	3,122	12.43	11.02	2.25	8.00	50.00

Source: Authors calculation from STATA 14 software.

Table I presents the definitions and summary statistics of the main variables in our sample. There are 3,122 valid respondents and half of them (1562) are stock market participators. Among the participators, respondents allocate 31% of their financial assets on stock market on average. In the full sample, respondents have an average leverage of 16%. *Riskaver* has a mean of 3.10 and a standard deviation of 1.06, and *Constraint* has a mean of 2.68 and a standard deviation of 0.92. The family wealth of respondents range from 80,000 (RMB) to 8.3 million (RMB) and has a mean of 1.7 million (RMB), while the average monthly income is 12,430 (RMB).

3. HOUSEHOLD LEVERAGE AND STOCK MARKET INVESTMENT DECISIONS

3.1. Stock Market Participators versus Non-Participators

Our goal in this paper is to investigate the influence of household leverage on their stock market investment decisions, and the underlying mechanisms. An important proxy of the respondent's stock market investment decision is the stock market participation, *Stockpar*. Therefore, we initially compare the sample distributions between stock market participators with *Stockpar* equaling to one and non-participators with *Stockpar* equaling to zero. We report the results in Table 2.

This table reports the comparison between stock market participators and non-participators. The respondents with *Stockpar* equaling to 1 are regarded as participators and the rest are regarded as non-participators. Leverage, *Riskaver*, *Constraint*, *Wealth*, *Income*, *Age*, *Gender*, *Education*, and *Financeedu* are defined in Table I. The table reports the mean values of above variables as well as the differences and t-statistics between participators and non-participators

Table-2. Stock Market Participators versus Non-Participators

	N	Leverage	Riskaver	Constraint	Age	Gender	Education	Financeedu	Wealth	Income
<i>Stockpar</i> =1	1562	0.14	2.81	2.52	33.99	0.71	3.07	0.78	2142.04	15.02
<i>Stockpar</i> =0	1560	0.17	3.38	2.83	34.49	0.71	2.88	0.71	1315.67	9.84
Difference		-0.04	-0.57	-0.31	-0.50	-0.00	0.19	0.07	826.37	5.18
t-statistic		-5.73	-15.62	-9.55	-1.82	-0.06	10.22	4.44	16.03	13.53

Source: Authors calculation from STATA 14 software.

There are 1,562 participators and 1,560 non-participators. Stock market participators and non-participators are similar in age and gender since the differences are indistinguishable to zero. However, participators have an average leverage of 14% which is about 4% lower than that of non-participators. It means that, generally speaking, respondents with higher leverage will be less likely to participate the stock market.

The average risk aversion measure of stock market participators is 2.81 which is significantly lower than the average risk aversion of non-participators, 3.38. In addition, stock market participators have significantly less severe financial constraint with a difference of -0.31. Consistent with the literature, stock market participators are

more likely to own higher education degrees, be more experienced in economics or finance, earn more, and be wealthier.

3.2. Probit Regressions of Stock Market Participation Decision on Leverage

In previous section, we find that stock market participators have significantly lower household leverage. However, the negative correlation between household leverage and stock market participation might simply be attributed to other existing factors which have been proved to affect individuals' stock market participation. We now control for the variables that are known to have an influence on stock market participation, such as wealth, income, age, gender, education degree, and financial education experience. We also control the squared wealth, income, and age for the potential nonlinear effects.

Table III reports the results of probit regressions. The z -statistics are clustered by cities and account for heteroscedasticity. Column 1 shows that, consistent with the results in the previous section, respondents with higher leverage are less likely to participate on the market. The estimated coefficient of leverage is -0.7290 with a z -statistic of -5.73 , which is significant at the 1% statistical level. A one-standard-deviation increase in leverage results in -12.30% ($\exp^{-0.7290*0.18}-1$) of probability of participation on stock market which accounts for a quarter of average *Stockpar*, meaning that the effect of leverage is also economically significant. In Column 2, we simply estimate a regression of stock market participation on wealth and income. Consistent with well-known results, respondents with more wealth and higher income have higher probability of participating on stock market. One noteworthy thing is that the marginal effect of wealth and income is diminishing since the estimated coefficients of squared wealth and income are significantly negative. In Column 3, we jointly estimate a regression of stock market participation on leverage, wealth, and income. The estimated coefficient of leverage gets smaller in magnitude comparing Columns 1 and 3, but remains significant. It means that household leverage still has additional influences beyond wealth and income. Finally, we further control for age, gender, education degree, and financial education experience in Column 4. The results show that the leverage effect is still highly significant, with a coefficient of -0.5568 and a z -statistic of -3.65 . The magnitude means that a one-standard-deviation increase in leverage still results in -9.54% ($\exp^{-0.5568*0.18}-1$) of probability of participation on stock market, after controlling for all the other variables.

Overall, we find from the probit regressions that household leverage has an economically and statistically significant impediment effect on respondents' stock market participation. The effect couldn't be explained by the well-known factors, such as wealth, income, age, gender, education degree, and financial education experience.

This table reports the results of probit regressions of stock market participation on household leverage in the full sample. The dependent variable is *Stockpar*, which is a dummy variable that equals one if the respondent holds individual stocks or mutual funds. The key independent variable, *Leverage*, is the ratio of the respondent's total debt to total asset. *Wealth*, *Income*, *Age*, *Gender*, *Education*, *Financeedu* are control variables which are defined in Table I. $Wealth^2$ is the square of *Wealth*. $Income^2$ is the square of *Income*. Age^2 is the square of *Age*. The squared variables are included for nonlinearities in the model. z -statistics clustered by cities are reported in parentheses. *, **, and *** stand for the statistical significance at 10%, 5%, and 1% level, respectively.

3.3. OLS Regressions of Stock Investment Rate on Leverage for Participators

In addition to the comparison of stock market participators and non-participators and the analysis of leverage on stock market participation, we proceed to investigate the effect of leverage on stock market investment rate among participators. The stock market investment rate measures investors' preference for risky assets. We run OLS regressions of the variable *Stockratio*, which is defined as the ratio of stock and mutual fund holdings to the total financial assets, on household leverage.

Table-3. Household Leverage and Stock Market Participation

Model	(1)	(2)	(3)	(4)
<i>Leverage</i>	-0.7290*** (-5.73)		-0.4644*** (-3.19)	-0.5568*** (-3.65)
<i>Wealth</i>		0.0005*** (8.01)	0.0005*** (7.34)	0.0004*** (6.79)
<i>Wealth</i> ²		-0.0000*** (-7.10)	-0.0000*** (-6.80)	-0.0000*** (-6.12)
<i>Income</i>		0.0646*** (8.11)	0.0718*** (8.99)	0.0656*** (8.42)
<i>Income</i> ²		-0.0010*** (-5.92)	-0.0012*** (-6.43)	-0.0011*** (-5.93)
<i>Age</i>				0.0483** (2.05)
<i>Age</i> ²				-0.0007** (-2.20)
<i>Gender</i>				-0.0007 (-0.02)
<i>Education</i>				0.2659*** (5.63)
<i>Financeedu</i>				0.1046* (1.77)
Pseudo R ²	0.8%	9.8%	10.0%	11.2%
Obs	3,122	3,122	3,122	3,122

Source: Authors calculation from STATA 14 software.

The results of OLS regressions are reported in Table IV. The *t*-statistics are clustered by cities and account for heteroscedasticity. In Column 1, we find that, in the univariate regression, the estimated efficient of leverage is 0.2137 which is highly significant with a *t*-statistic of 6.65. A one-standard-deviation increase in leverage is associated with an increase of 3.85% (0.2137*0.18) in stock market investment rate, which accounts for 27.5% of average *Stockratio* for participators. It indicates that the positive influence of household leverage on stock investment rate is economically significant. We then estimate the effects of respondents' wealth and income on stock investment rate in Column 2. The interesting finding is that the estimated coefficients of wealth and income turn to be negative but insignificant. Both of the economic and statistical significances of leverage on stock investment rate of participators are less than those on stock market participation of all respondents, as shown in Table III. It's consistent with the famous Markowitz's Two-Fund Separation Theorem that the wealth and income of investors will not directly influence their allocation in risky assets unless the risk preference are connected to wealth and income. When we estimate the effects of leverage, wealth, and income together in Column 3, the estimated coefficient of leverage remain positive and highly significant. We further add other control variables, including age, gender, education degree, and financial education experience, in the last column. Comparing Columns 1 and 4 shows us three important results. First, the estimated coefficient of leverage barely changes in magnitude or significance whether other well-known factors are controlled or not. Second, the control variables appear to have no statistically significant effect on stock investment rate of participators, except income and financial education experience while the economic significances are much smaller than that of leverage. Third, the adjusted R² increases from 2.8% to 4.7% when other well-known factors are controlled. In contrast, adding other well-known factors increases the pseudo R² from 0.8% to 11.2% for the probit regressions in Table III.

This table reports the results of OLS regressions of stock market investment rate on household leverage for participators. The dependent variable is *Stockratio*, the ratio of stock and mutual fund holdings to the total financial assets. The key independent variable, *Leverage*, is the ratio of the respondent's total debt to total asset. *Wealth*, *Income*, *Age*, *Gender*, *Education*, *Financeedu* are control variables which are defined in Table I. *Wealth*² is the square of *Wealth*. *Income*² is the square of *Income*. *Age*² is the square of *Age*. The squared variables are included for nonlinearities in the model. Heteroskedasticity-robust *t*-statistics clustered by cities are reported in parentheses. *, **, and *** stand for the statistical significance at 10%, 5%, and 1% level, respectively.

Table-4. Household Leverage and Stock Investment Rate for Participators

Model	(1)	(2)	(3)	(4)
<i>Leverage</i>	0.2137*** (6.65)		0.1966*** (6.42)	0.2007*** (6.35)
<i>Wealth</i>		-0.0000* (-1.79)	-0.0000 (-1.00)	-0.0000 (-1.15)
<i>Wealth</i> ²		0.0000 (1.19)	0.0000 (0.71)	0.0000 (0.82)
<i>Income</i>		-0.0014 (-0.98)	-0.0031** (-2.18)	-0.0028* (-1.92)
<i>Income</i> ²		0.0000 (0.19)	0.0000 (1.44)	0.0000 (1.17)
<i>Age</i>				0.0049 (1.14)
<i>Age</i> ²				-0.0000 (-0.60)
<i>Gender</i>				-0.0008 (-0.07)
<i>Education</i>				0.0117 (1.18)
<i>Financeedu</i>				-0.0248* (-1.98)
Adj. R ²	2.8%	1.6%	3.7%	4.7%
Obs	1,562	1,562	1,562	1,562

Source: Authors calculation from STATA 14 software.

In sum, we find that for stock market participators, higher household leverage is associated with higher investment rate on stocks and mutual funds. The effect of leverage on stock market investment rate is not explained by other well-known factors. In fact, respondents' wealth and income are negatively correlated to the stock market investment rate while the correlation is insignificant.

4. THE UNDERLYING MECHANISMS BY FINANCIAL CONSTRAINT AND RISK AVERSION

We now examine the underlying mechanism of how household leverage affects their stock market investment decisions. We first focus on the financial constraint of each respondent and then test whether the risk aversion could help explain the influence of household leverage on stock market investment decisions.

4.1. Financial Constraint

Financial constraint measures the ability of households to borrow money when they are short of cash. Households with high leverage are more likely to suffer financial distress if they face more severe financial constraint. Therefore, financial constraint together with household leverage may affect their stock market investment decisions since investing on stock market is risky. In this section, we aim to investigate whether financial constraint play an important role in the correlation between household leverage and stock market investment decisions.

We measure households' financial constraint by *Constraint* which varies from 1 (least severe) to 5 (most severe). We firstly sort all respondents into five groups according to their *Constraint*. In each group, we run probit regressions of stock market participation, *Stockpar*, on *Leverage* with other variables controlled. The results are reported in Panel A of Table IV. In the least severe group with *Constraint* equaling to 1 and the group with *Constraint* equaling to 4, the estimated coefficients of *Leverage* are -1.1316 and -1.1058, both of them statistically significant with *z*-statistics of -3.06 and -2.96. The above estimated coefficients are double the size of -0.5568 in Table III, indicating that the impediment effect of leverage on stock market participation is stronger when the

financial constraint variable *Constraint* equals 1 or 4. However, the estimated coefficients of *Leverage* are smaller in magnitude and less significant for other three groups. We find that there are no clear patterns for the different groups in Panel A, which means that financial constraint cannot explain the impediment effect of respondents' household leverage on stock market participation.

We then focus on the stock market investment rate of participators. All participators are sorted into five groups by *Constraint*. In each group, we run OLS regressions of stock investment rate, *Stockratio*, on *Leverage* with other variables controlled. The results are reported in Panel B. We find that the group with more severe financial constraint has smaller estimated coefficient of *Leverage*, although not strongly monotonic. In the least severe group, the estimated coefficient of *Leverage* is 0.3966, which is larger than that in other groups and nearly double the size of 0.2007 in Table IV, with a *t*-statistic of 4.44. It means that the positive correlation between leverage and stock investment rate is the strongest when households have the least financial constraint. The estimated coefficient in the group with *Constraint* equaling to 4 is insignificant and that in the group with *Constraint* equaling to 5 turns to be negative, indicating that household leverage will have no impact on stock investment rate when their financial constraint get tightened. The results provide evidence that the financial constraint acts as a strong moderator for the influence of household leverage on stock investment rate for participators.

Table-5. Underlying Mechanism by Financial Constraint

	Financial Constraint				
	1	2	3	4	5
Panel A: Household Leverage and Stock Market Participation					
<i>Leverage</i>	-1.1316***	-0.6211*	-0.3413*	-1.1058***	-0.7208
	(-3.06)	(-1.67)	(-1.92)	(-2.96)	(-0.95)
Controls	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	16.4%	11.8%	8.3%	8.4%	19.0%
Obs	367	822	1,464	391	78
Panel B: Household Leverage and Stock Investment Rate for Participators					
<i>Leverage</i>	0.3966***	0.0979**	0.2360***	0.1003	-1.3277
	(4.44)	(2.11)	(4.34)	(0.78)	(-1.61)
Controls	Yes	Yes	Yes	Yes	Yes
Adj. R ²	11.3%	3.9%	4.8%	0.5%	33.1%
Obs	246	445	701	151	19

Source: Authors calculation from STATA 14 software.

We firstly sort respondents in the full sample into 5 groups according to the respondents' financial constraint measure, *Constraint*, which is from 1 (least severe) to 5 (most severe). In each group, we run probit regressions of stock market participation (*Stockpar*) on the household leverage measure (*Leverage*). The results of probit regressions are reported in Panel A. We then sort stock market participators into 5 groups according to the participators' financial constraint measure. In each group, we run OLS regressions of stock market investment rate (*Stockratio*) on household leverage measure (*Leverage*). The results of OLS regressions are reported in Panel B. *Wealth*, *Wealth*², *Income*, *Income*², *Age*, *Age*², *Gender*, *Education*, *Financeedu* are controlled in each regression. Results of control variables are not reported for simplicity. *, **, and *** stand for the statistical significance at 10%, 5%, and 1% level, respectively.

Overall, we find that financial constraint couldn't help explain the effect of household leverage on stock market participation but works well as a moderating variable for the effect of household leverage on stock investment rate for participators. For the respondents with less severe financial constraint, household leverage will have stronger enhancement in the investment rate on stocks and mutual funds.

4.2. Risk Aversion

In previous section, we test the underlying mechanism of household leverage on stock market investment decisions by financial constraint. Now we are going to test an alternative mechanism, which is the risk aversion effect. Individual's stock market investment decisions might be determined by the risk preference. Conservatives are also less likely to hold heavy debt because high leverage increases the investment risk and liquidity risk. As a result, the influence of household leverage on stock market investment decisions might simply be attribute to the risk aversion. The respondents' risk aversion measure, *Riskaver*, is from the survey and varies from 1 (least risk averse) to 5 (most risk averse). Similar to the analysis in previous section, we firstly sort all respondents into five groups according to their *Riskaver* and run probit regressions of stock market participation on household leverage with other variables controlled. The results are shown in Panel A of Table VI. The estimated coefficients of *Leverage* in groups with *Riskaver* equaling to 3, 4, and 5 are -0.7970, -0.5271, and -0.8297, respectively. All of them are statistically significant at 5% level. However, the estimated coefficients of *Leverage* in the first two groups with *Riskaver* smaller than 3 are relatively smaller in magnitude and indistinguishable to zero. Above results show us that, generally speaking, the impediment effect of household leverage on stock market participation is stronger when they are more risk averse. It's consistent with the fact that raw participation rate decreases from 65.3% (145/222) to 17.3% (59/342) as respondents' *Riskaver* increases from 1 to 5.

We further study the potential role of risk aversion in the correlation between household leverage and stock investment rate for participators. We sort all participators into five groups by *Riskaver* and run OLS regressions of stock investment rate, *Stockratio*, on *Leverage* with other variables controlled. The results are reported in Panel B of Table VI. We find that the estimated coefficient of *Leverage* is almost monotonically decreasing from 0.3656 to 0.0553 when *Riskaver* increases from 1 to 5. Besides, the estimated coefficient of *Leverage* becomes insignificant when respondents' *Riskaver* is larger 3.

We firstly sort respondents in the full sample into 5 groups according to the respondents' risk aversion proxy, *Riskaver*, which is from 1 (least risk averse) to 5 (most risk averse). In each group, we run probit regressions of stock market participation (*Stockpar*) on the household leverage measure (*Leverage*). The results of probit regressions are reported in Panel A. We then sort stock market participators into 5 quintiles according to the participators' risk aversion proxy. In each group, we run OLS regressions of stock market investment rate (*Stockratio*) on household leverage measure (*Leverage*). The results of OLS regressions are reported in Panel B. Wealth, Wealth², Income, Income², Age, Age², Gender, Education, *Financeedu* are controlled in each regression. Results of control variables are not reported for simplicity. *, **, and *** stand for the statistical significance at 10%, 5%, and 1% level, respectively.

Table-6. Underlying Mechanism by Risk Aversion

	Risk Aversion				
	1	2	3	4	5
Panel A: Household Leverage and Stock Market Participation					
<i>Leverage</i>	-0.4036 (-0.71)	-0.2340 (-0.66)	-0.7970*** (-3.74)	-0.5271** (-2.33)	-0.8297** (-2.14)
Controls	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	19.4%	8.8%	10.6%	7.0%	16.8%
Obs	222	620	1,252	686	342
Panel B: Household Leverage and Stock Investment Rate for Participators					
<i>Leverage</i>	0.3656*** (2.85)	0.1800** (2.58)	0.2388*** (5.83)	0.0938 (1.34)	0.0553 (0.27)
Controls	Yes	Yes	Yes	Yes	Yes
Adj. R ²	14.6%	6.5%	4.4%	2.8%	20.5%
Obs	145	393	694	271	59

Source: Authors calculation from STATA 14 software.

In sum, we find that risk aversion could help explain the effect of household leverage on stock market participation because the impediment effect only works when respondents' risk aversion is high. In addition, risk aversion is also a strong moderator for the influence of household leverage on stock investment rate for participators. The less risk averse are the participators, the stronger is the enhancement of household leverage in the investment rate on stocks and mutual funds.

5. CONCLUSION

Although the capital structure has been long studied on firms, the increasing attention and empirical studies on household finance lead us to investigate the capital structure of families which refers to the household leverage in this paper. Household leverage might have an influence on the investment decisions in stock market since investing on stock is risky. We use a unique data set from China Center of Financial Research's household survey in 2012 to study the correlation between household leverage and their stock market investment decisions.

First, we find that household leverage has an impediment effect on stock market participation, meaning that respondents with high leverage are less likely to participate on the stock market. Second, for stock market participators, higher household leverage is associated with higher investment rate on stocks and mutual funds. It indicates that investors who have more loan and debt are investing more on risky assets, consistent with the moral hazard hypothesis in the literature.

We further examine the underlying mechanisms of the influence of household leverage on stock market investment decisions. Financial constraint is a good moderating variable for the effect of household leverage on stock investment rate for participators. The enhancement effect of leverage on the stock investment rate is stronger for the stock market participators when they face less severe financial constraint. Risk preference can help explain the household leverage effect. The impediment effect of household leverage on stock market participation only works when households are strongly risk averse while the enhancement effect of household leverage on stock investment rate only works when participators are slightly risk averse.

Funding: We gratefully acknowledge the support from National Natural Science Foundation of China (program: 71472100). We thank China Center of Financial Research for kindly providing the survey data.

Competing Interests: The authors declare that they have no competing interests.

Contributors/Acknowledgement: Both authors contributed equally to the conception and design of the study.

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