



Risk Preference vs. Income + Spending

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Abstract. This paper provides a detailed explanation of categories of risk preference and classification of the risk level. Also, the evidence of how the main variables react to risk preference. Our analysis is based on the 2018 CFPS family samples and personal panel. Adopting Stata analysis technology, and using it in the influence assessment of all variables. Our consequences illustrate the impact of risk preference is complicated because multiple variables affect risk preference together and these influences are significant in acceptable ranges. Likewise, some robust examinations are stable and acceptable.

Keywords: risk preference · risk level · total income · expenditure · model fitting and data analysis

1 Introduction

In contemporary society, when it comes to risk preference, most people will first think about the domains related to the economy and finance. Certainly, this inertial thinking is not wrong, but not comprehensive. The risk preference experiment was first initiated by the well-known Israeli psychologists Kahneman and Twowski (1979), who have considerable reputation. People laws about risk preference can be revealed from the risk experiments and the reasons why people make changes in their risk attitudes can be further studied. So far, many researchers have observed people's attitudes when faced risk options with all kinds of methods. Risk preference doesn't just play a role in the field of economics, its shadow also appears in other fields such as education [1] and healthcare (Anderson L R, Mellor J M, 2008). Furthermore, it can be used to explain the discrepancy between the behavior and interindividual. For instance, people are able to make the decision that how to dominate their finance choices [2] or do some bad things that are not allowed by law, such as theft and robbery.

Risk preference refers to the fundamental attitudes of units, such as companies and individuals who are willing to undertake the size and type in order to achieve the targets. To be more specific, the risk is a kind of uncertainty, and the preference is an exact symbol of risk preference.

We make a hypothesis according to the previous experiment, before introducing three different risk preference types. Respondents make a decision between option one, which is certain to yield \$1,500, and option two, which has an equal probability of acquiring \$2,500 and \$500. Also, the expected value of these two choices is the same. In Fig. 1, x

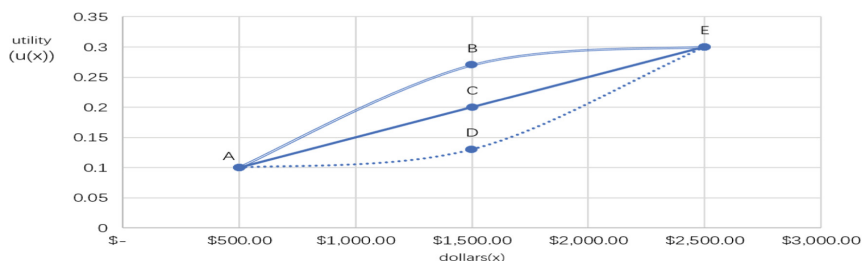


Fig. 1. Preference type

is the income level and y are the peoples' satisfaction degree. The utility of 0.2 and 0.3, corresponding to \$1,500 and \$2,500, express that people's satisfaction degrees improved with the revenues' increase. Specifically, the solid straight line in the middle represents risk neutrality, which illustrates the utility of C is equivalent to the aggregation of a 50% of A's utility and a 50% of E's utility. This line is the easiest one to conclude at a glance the relationship between utility and money. Moreover, this category has specific traits in that they are indifferent to two choices. In other words, the amount of money has no attractions for them.

To study and distinguish other different types of risk preference, we compare the rest curved lines, which are shown by doubled solid curve and dotted curve in Fig. 1. It is clear that doubled solid curve's utility increases slowly from A to B as the increase in profit, whereas its growth rate soars when the revenue reaches a certain value, with point B. This trend means that people who are risk averse will lose their willingness to take risks with the increase in return rate and they only accept expected returns that are higher than the average return. The dotted curve, however, has an identical trend, but its growth rate reverse completely. Compared with the doubled solid curve, this kind of curve go up significantly, especially in the period from D to E. Undoubtedly, this curve represents these people who are more willing to take risk as the increase of profit rate.

I use the 2018 family samples in CFPS to observe what causes the risk preference changes and how the influence extent. Finally, I find that in the main variables, wage income and operational income; medical expenditure, educational expenditure, and insurance have an intuitive impact on risk preference. Other covariables including age, gender, student or not, and marriage or not have a certain influence on risk preference.

This paper proceeds as follows. we found previous literature in terms of some variates that related to my research direction and listed in Sect. 2, such as the relationship between health insurance and risk preference [3], the changes of different age groups for risk preference [4], wealth relationship between risk level, Urban and rural differences [24] and how risk preference affects Marital status [25]. After that, Sect. 3 is divided into four parts, which specifies indicators of investigating data. In addition, Table 1 presented throughout the whole part 3. The first part describes the reason why we chose the CFPS as the respondent platform and simply introduces CFPS's origin and use range. The following three parts orderly describe the division method of risk level by an interesting experiment, regression, and analysis of subjective variables and covariates respectively.

In order to observe easily, we build an equation containing all relative variables in Sect. 4 to represent the influence extent of each variable on the whole. Subsequently, we make the summary in the last section.

2 Literature Review

Past literature has shown that risk preference. Based on the relationship between existing research and my topic, expenditure, income and risk preference, we research a series of fields which is related to my topic. The insurance field changes attitude to life in a large certain. In this regard, Musgrave et.al thought that the availability of insurance could generate an increase in the willingness that people to undertake risky activities. After that, Shiller [5] (1994), with several contemporary applications, complemented incomplete capital market also influence personal willingness. However, some controversies have arisen, and hoped to prove their theory through experimental outcomes. But, a series of experiments ended in failure, such as the test of protection for small independent producers (Carter&Coles, 1997). Finally, Bardhan et al [27] supposed that the situation of allowing manufacturers to purchase insurance is able to rate rich people's risk undertaking. The Indian crop insurance project (1980) gives the best illustration. After this, some people conclude the analogical outcomes through experiments.

Risk preference is not only in business insurance but also in the medical insurance. The conclusion that risk preference is an important behavior factor in choosing different medical insurance has been proposed by Holt and Laura in their model. Bernstein [6] (2009) in his research, adopting the data of risk preference from the Medical Expenditure Panel Survey (MEPS), found that risk preference doesn't cause the ascent in the rate of insurance coverage in the group of young. Conversely, young people prefer to have no insurance because they are hard to afford insurance. In order to further investigate, Condliffe S and Fiorentino G T [7] (2014) used multivariate regression to analyze the eight years of data in the US and measure the effects of risk preference in insurance and the equations of spending. The final consequence shows that if people are in the middle or higher risk preference, the probability of an individual being rejected for insurance increases. This also means that risk lovers who are insured spend less than those risk-aversion on healthcare Hence preference is a crucial factor in the situation people choose medical insurance or not.

So far, some famous economists, biologists, and experts in other relevant fields have investigated the reason for how the life cycle affects risk choices, such as Rogers [8] (1994) and Daly and Wilson [9] (1997). They consistently think that aging is related to the decline in risk-taking. Some research thinks risk-taking reaches thank in young people [9]. Based on this theory, Mata R [26] and Josef [10] made a deep study that quantified the discrepancy about ages on risk behaviors in 2011 and concluded when learning results in an act of risk aversion, older people are more risk-love than young people. By contrast, elders will be easier to avoid risk if learning generates the behavior of risk-seeking. In addition, Meta-analysis made by Hertwig (2011) gave the conclusion that the discrepancy of risk preference related to age is different in the different tasks and making-decision. In short, variable age is complicated for risk choices, but also an important part. Subsequently, in experimental research of 135 observations aged from

12–60, Tymula et al. [11] (2013) agreed with the conclusion that aged are more risk averse than the middle-aged person who worked in the same field as elderly.

Besides the influence of age, a geographical factor also changes risk preference among people. When people dwell at a definite site, they are easier to be affected by the surrounding environment and people, and further have to convert to another attitude that is suitable for there. Hence, moving to a new place also need to take a risk. The situation of rural-to-urban migration in Ukraine gives certain evidence to illustrate risk preference is different in the urban or in the countryside. Before this, some people have researched analogical experiments. For example, talent flow in Germany. Jaeger [12] (2010) indicates in his research that these labors who would like to take risks are more likely to flow into the labor market. Because other sites that have incomplete information may bring extra non-monetary costs. Then, Jaeger et al. (2010) and Bauernschuster et al. [13] (2014) accord that risk attitude has great predictive ability in the migration making-decision, and the final illustration that risk lover is easier to migrate, this is because risk lover is able to deal with the uncertainty of removing new places. In other words, it can be said risk willingness has a positive relationship with migration preference. Furthermore, generating a discrepancy in risk preference between rural-urban people.

Another research also points out that there is a strong relationship between parents and their children. Likewise, they also purposed that there was a strong positive relevance between the risk attitude and trust attitude. These children who have fewer siblings are easier to encounter the influence of their parents at the aspect of the risk level. Knowles and Postlewaite [14] (2005) use the CFPS's data (100 people aged from 1–25) to observe the time preference relevance between parents and children. Similarly, Reynolds, Leraas, Collins and Melanko [15] (2009) make an analogical experiment with a small sample, whereas the outcomes are not satisfactory. Furthermore, Kosse and Pfeiffer [16] (2012) in a similar investigation found that time preference has a strong relationship in a short term, but no obvious evidence in the long term. In a family, the willingness to take risks and the willingness to trust are the most important factors among households. Parental attitudes towards investment will also affect children's views and the magnitude of the effect is considerable. According to the research, the children's gender not affects the transmission, but the family framework is also vital. However, this is specific to the transmission of trust. The best predictor of children's response to a given trust problem is always the parents' responses corresponding to the same problem. Previous conclusions show that fathers are more likely to get along with male offspring, whereas mothers are with female offspring [17].

3 Data

3.1 CFPS

The data used in this paper is CFPS 2018. Chinese Family Panel Studies (CFPS) is implemented by the China Social Science Investigation Center of Peking University. It aims to reflect the changes in Chinese society in terms of economy, population, and education by tracking data at three levels: individual, household, and community. Initially, it was experimented in the most representative cities in China, like Beijing, Shanghai,

Table 1. Variable summary statistics

Variable	Observation	Mean	Standard deviation	Min	Max
<i>Panel A (risk preference question)</i>					
Risk preference Q1	32,158	1.9720	1.7156	1	5
Risk preference Q2	24,311	1.5168	1.3417	1	5
Risk preference Q3	21,150	1.6773	1.5002	1	5
Risk preference Q4	7,801	4.0027	1.7361	1	5
Risk preference Q5	5,855	3.8338	1.8108	1	5
Risk preference level	32,091	2.3482	1.8203	1	6
<i>Panel B (regressors of interest)</i>					
Business income	13,996	8,750.028	61,573.68	0	5,500,000
Property income	2,123	10,726.18	27,231.23	1	800,000
Transfer income	13,968	16,255.78	150,435.8	0	9,086,800
Other income	14,209	1,505.037	16,392.07	0	1,000,000
Total income (one year)	13,803	69,737.6	436,414.3	1	50,000,000
Total expenditure (one year)	13,785	44,900.13	67,348.2	1	1,850,000
Education spending	7,057	9,499.023	12,889.37	1	300,000
Healthcare spending	12,331	6,599.68	16,764.83	3	380,000
Insurance spending	4,421	6,722.96	9,318.92	1	100,000
Other spending	1,995	3,957.684	16,200.94	2	500,000
<i>Panel C (covariate)</i>					
Age	32,669	44.0762	18.6105	9	96
Gender	32,669	0.4989	0.5000	0	1
Party	32,669	-7.2947	2.4187	-8	1
Habitation	13,996	0.5181	0.4997	0	1
Marriage	30,173	2.0784	0.8503	1	5
Health	32,665	2.9540	1.2249	1	5
Employ	28,292	1.4789	0.8535	1	3
Student	15,730	3.9638	1.7525	1	5
Employ	27,482	1.4732	0.8500	1	3

Shenzhen, and other regions. This project started to prepare in 2005 and accomplished the first wave in 2008. The first phase takes 12 years, from 2008 to 2020. In the initial two years, CFPS implemented the baseline survey formally in the 25 provinces around China. These two years belong to the pre-survey and follow-up test investigation. Also,

the official survey completed the interview of 14960 households and 42590 individuals in total in 2010. So far, there are 5 waves that enable use normally.

CFPS is one of the most successful national survey databases to date. It also provides the data base for academic research and public policy analysis. Many works of literature used CFPS to investigate their topics, such as family savings [18], the savings rate [19], cognitive ability [20], relationship and family financial investment decision [21], health level and income gap [22] and non-agricultural employment [23].

Here are some advantages of CFPS, Families selected by CFPS will include all family members and even future newborns and adopted children are included. Hence, family network information is detailed in CFPS. CFPS will study all the details, except for the extremely private questions, and a similar survey will be launched every two years. Moreover, related to individuals' risk preferences, we use the 2018 CFPS dataset as it includes a bunch of questions, which is rarely seen in other datasets. It also completed the interview of 14960 households and 42590 individuals in total. CFPS2018 started in June 2018 and finished in March 2019. This survey includes not only all families visited in 2016, but also contains families visited in any round from 2010 to 2014 but not successfully tracked in 2016. Finally, they completed about 15000 families' views and collected personal questionnaires around 440000 during the period of CFPS2018's experiment. It also includes other variables such as age, gender, even the Chinese zodiac, and marital status, which are also related to a person's risk preference and can be used as covariates in the research.

3.2 Outcomes: Risk Levels

A unique section of CFPS 2018 covers questions on people's preference for alternatives, which enables us to understand respondents' risk tolerance levels. In the person part of the CFPS in 2018, there are a series of five questions asking, including the question of whether you decided to get a fixed amount of money or choose equal probability of getting \$200 and \$0, and other analogical questions. Respondents are requested to opt between two options. All of the questions (whether choose a fixed payment) possess identical to option 2 and option 1 only changes in value.

The first thing we do is to group people into 6 risk levels based on their responses, and risk appetite increases with risk level from 1 to 6. These people who are in risk level 6 are more risk-seeking, and they belong to the type of Enterprising person who bears the fluctuation of the investment products easily and of cause can stand the consequence that the option brings. in a short, the only aim of risk-seeking is to obtain excess returns. By contrast, people in risk level 1 who belong to the conservative are most risk averse, which specifies investors unwilling to accept temporary investment loss and even refuse the decrease of investment products.

As shown in Fig. 2, the top question, needs a decision between a certain payment of \$100 and a half chance of getting \$200 and \$0 respectively. To be more specific, the outcome of the observation is that people who directly accepted \$100 account for 74.52% of 32669 observations. These people will take part in question 2, which is a similar test where only the value of the sure payment changes to \$80. So, if you still choose a certain payment of \$80 you will enter question 3. However, you will stop the experiment and be divided into risk level 3(Get lottery) when option 2 is chosen by you.

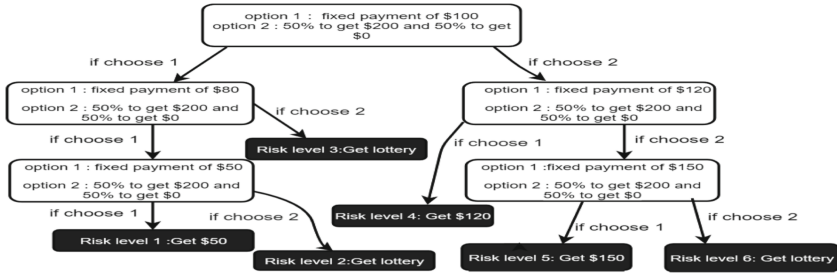


Fig. 2. Classification of risk level

In my research, about 9.61% were in risk level 3, and 64.8% of my sample continued to experiment. Then, the sure payment declines to \$50 in question 3. Risk Level 1 is a symbol of people’s choice of \$50 and if you are in Risk level 2(Get lottery) it represents that you select option 2 in question 3. Additionally, there is no lower payment except \$50 in my experiment.

Compared with question 2, people are willing to bet whether they can earn \$200. Expectedly, 3581(10.96%) people chose option 2 in question 3 and about 54% wanted to acquire \$50. Conversely, if you didn’t choose 2 at the beginning you will participate in question 4. Meanwhile, more than half of the respondents are not suitable anymore in my research. Another contrary discrepancy is that the sure payment no longer drops but goes up from \$100 to \$120 in risk question 4 and to \$150 in risk question 5. If you are satisfied with gaining \$120 you will be in risk level 4(Get \$120). Subsequently, risk question 5 will be the last experiment for you. Finally, 1945 people took up risk level 4 and 1707 people in my research are in risk level 5(Get \$150), whereas only 4148(12.7%) are in the highest risk level 6(Get lottery). In addition, risk preference Q1–Q5 in Table 1 give the corresponding consequence, which is all the choices “Get certain money directly” are represented by 1, and 5 is a symbol of people who choose option 2. Detailed answers to those questions can be found in Table 5, 6, 7, 8 and 9.

In Table 1, the proportion of the population that chooses the fixed payment varies under different questions. It is intuitive since the fixed payment decreases following risk-averse choices and increases following risk-seeking choices. People will make the best choice for themselves at different levels due to everyone’s tolerance being limited, so in this experiment the more you take on, the more you will get. It is easy to see that this situation generates an average value difference. In addition, all of the standard deviations in every question are similar, in the range of 1–2. Based on answers to those questions, I create a variable to systematically measure the risk preference level and it is shown in the last row of panel A, which is used in the main analysis. On average, people are in risk level 2, with a standard deviation of 1.8203.

3.3 Regressors of Interest: Income and Expenditures

The relationship between an individual’s risk capacity and sources of funds has been shown in Sect. 2. Therefore, I choose two measures of money—family income and family expenditures as main regressors. Total income and expenditures arise in the main

results. Total amounts are also divided into multiple categorical respectively and shown as heterogeneous results. In Table 1, the data illustrate that on average total income of a household is 69,737.6yuan with a max 50,000,000yuan and min 1yuan standard deviation of 436,414.3. Similarly, the counterpart of total expenditure is 44,900.13yuan, 1,850,000yuan, 1yuan, and 67,348.2yuan.

In terms of income, it contains operational income, property income, transfer income, and other income. First, wage income symbolism these employment incomes of agricultural or non-agricultural, occupying an indispensable part in people's life. The second one is operational income, which includes people's own agricultural production income and their part of the income of individual and private enterprises. In addition, other income includes gifts and other aspects and it accounts for a lower proportion rather than others. Next one, Property income, including movable (e.g. bank deposits, vehicles) and immovable (such as houses) property. If property income is stable in a higher level, people will distribute other extra incomes willingly. If so, the belief in risk-taking is greatly enhanced. The last one, transfer income (specifically including the government subsidies and social private donations received by family), goes up with the increase of government supplements, People can mitigate life pressure with these subsidies and even take risks appropriately. Conversely, these decreases of various income generate risk levels decline when people take the risk. Based on the principle that enough money is capital, all kinds of revenue whatever more or less could easily bring people belief and satisfaction. By contrast, without assets or a stable income, most people are hard to persuade themselves to take risks. After all, people are more fearful to lose rather than possessing more.

Another significant category is an expenditure, which consists of medical spending, business insurance spending, educational spending, and other spending. To start with, medical spending mainly represents the sum of directly paid medical expenses and fitness expenses. Secondly, educational spending contains all kinds of projects about education activities Next, other spending points out that other expenditure of life consumption. The final kind is business insurance spending which comprises medical insurance, property insurance, and endowment insurance. When people hold a series of spending activities, they could acquire a kind of gratification from these behaviors. It affects people's rational judgment to a certain extent and imperceptibly takes a risk with these minds. Others like insurance items could give individuals belief potentially and urge people to take a risk because they think that their all behave have enough protection. Undoubtedly, spending directly affects risk preference among people.

3.4 Covariates

(Note: Hukou, the general term of household and population, takes the family as Hu and people as you. In China, we always use the residence booklet as the carrier for Hukou, to keep and record the basic information of residence.

A party member is a member of a political parthood also agrees on the policies and program of a political party, abides by the constitution, and voluntarily joins the party.)

Besides the key regressors, there are some covariables correlated with the dependent variable, as shown in Sect. 2. They should be added in the regression as the independent

variables, including the following variables: age, gender, party, marital status, whether one has a rural Hukou or urban Hukou, and whether a student or not.

In Table 1, the variables of age and gender are first added as covariates in my model given the strong relationship shown in Sect. 2 (Tymula et. al, 2013 Sahm, 2012). This is inevitable that different age groups will make diverse decisions. Some young people who have just entered society may make a more aggressive decision in order to prove themselves to others and face life reluctantly, for example, some youths enter the stock markets (which is a financial product that is high risk with high return), whereas, their incorrect behaviors may result in losing everything. Similarly, there are futures speculation and corporate bonds. Conversely, older people have a large possibility to choose conservative products, such as national debts, and monetary funds, because they are desireless.

In our datum, the average age in the sample is 44, with a standard deviation of 18. The youngest and oldest samples are 9 and 96 respectively. We denote male as 1 and female as 0. The values for average reach 0.4988, which represents the percentage of females slightly more than the number of males. Expectedly, the standard deviation also reaches about 0.5. Males and females are different completely in many aspects like emotion, intuition, and even the first thing to consider when encountering troubles. From the aspect of party members, if you are a party member you will more rational than the general public because you have received much theoretical knowledge and are hard to be tempted. As we can see the common hypothesis is a 0–1 test and either is gender or inhabitation. In addition, an interesting phenomenon different from Gender rank is that ‘1’ and ‘-8’ are used to represent the party member or not. In Table 2, the row of Party illustrates that the average figure is -7.2974 which means about (81.0822%) observations do not belong to the party. From the specific value, only minority people belong to the big family of the Party, about 2900 people, and the standard error controls at the level of 0.5. The rest variables also keep similar situations. ‘1’ represent that you are healthy in Health line. Similarly, if you are a student the Stata will also show figure ‘1’. These above variables belong to one category ‘1’ and ‘5’ express the right or wrong of the question. The most special variable is Employ and marriage, ‘0’ ‘1’ and ‘3’ are used to illustrate three work conditions which are unemployment, being employed and retired. In addition, the situation of marriage is divided into 3 sessions, consisting of unmarried, married, and divorced, which present 1, 2, and 4 respectively.

As we all know, risk attitude is an indispensable factor that explains a series of behavior making-decision like residential storage, spending, investment insurance, healthcare expenditure, and others. Besides, in consideration of the fact that the changes after marriage, we can't ignore the influence that a couple of people live together for risk preference. In other words, you won't care so much about your gains and losses when you live alone. Fundamentally, people could think that they are able to undertake outcomes of things that they decide to do. In other words, nobody can prevent them. Whereas people need to endure many strains after getting married. For example, daily necessities, food, housing, car loan, and even the matters of the school where their children go in the future. These following problems influence people to avoid risk. in my view, investigating the situation of whether people got married is also important. Four-fifths of the sample are married in my data, about 23000 people. I also consider the factor of health in order

to test if people would like to take a risk when they are sick. In addition to the above variables, I also add employment as a covariate. Only one-quarter of the observations are in the situation of unemployment or retirement and the rest people who maintain normal working are three times as much as the sum of other working conditions. Moreover, if you are student you will possess less money than adults to make the risk investment. It's common that students also have little chance to touch risk issues. From the aspect of making a decision, in consideration of the fact that most students have no income sources and they may have a competitive mentality as a result of their want to have enough money to show off. Furthermore, they will choose the highest profits under the circumstance of preserving money that they own now.

Above all are covariables that consider personal aspects. The only covariable which analyzed influence from the geographical position is inhabitation. Compared with urban residents, rural exhibitions are in a low status in the aspect of information acquisition channels and methods due to the geography and institutional isolation over the development period of the division of urban and rural areas in China. Maintaining outdated attitudes result in people who live in the countryside being at risk avenues, further generating a series of issues about rural development. If there is no administration to suppose solutions, the adoption rate of farmers will keep a lower figure for new agricultural technology. Then, preventing the exploration of advanced technology and species in rural areas. Compared with rural life (49%), people are more likely to live in the urban with an advanced life environment (51%). Therefore, covariates also influence risk preference as the independent variable.

In order to deeply comprehend the back relationship, I add these as one of the control variables. In fact, there are many variables in the data of CFPS. However, I finally decided to choose these which are in Fig. 1. Because these covariables are more important than others in my view.

4 Main Results

The model we use to generate the results is as follows:

$$R_{i,h} = a + \beta I_{i,h} + C_{i,h}\alpha + \varepsilon_{i,h} \quad (1)$$

Equation 1 is used to evaluate the influences of family income on risk preference using multiple income metrics. $R_{i,h}$ is an indicator that reflects the risk preference level for individual i in household h , with a value from 1 to 6. a series of family income, including total income $I_{i,h}$, operational income, property income, transfer income, and other income, are used to measure the income level of individual i in household h and then, C represents many covariates, including observations' gender (males or females), age, marital status (married, not married and divorced), party member (yes or no), education (student, working and retired) and habitation (living in countryside, city or unclear). Epsilon is the error term. I use robust standard error and clustered the standard error at the household level in the main results.

β is the coefficient I am interested in. It captures the effect of family income on risk level. It is a vital part that proves whether risk level and family income are in a positive relationship. However, theoretically, we expect it to be positive if family income increases

and vice versa, as strong financial strength is able to enforce the ability of risk tolerance. Finally, α intercept alpha represents the coefficients of control variables.

$$\mathbf{R}_{i,h} = \mathbf{a} + \gamma \mathbf{E}_{i,h} + \mathbf{C}_{i,h} \alpha + \varepsilon_{i,h} \quad (2)$$

Equation (2) is built similarly in order to mainly observe the risk level promotion with the changes in family expenditure. However, there is a discrepancy in that new coefficient and variable replacing the previous part of family income. $\mathbf{E}_{i,h}$, a set of expenditures, comprises total expenditure, educational spending, medical spending, insurance spending, and other spending for individual i in household h . Moreover, γ is also a vital coefficient, reflecting the influence of expenditure on risk level. Contrary to income, we rule its value is positive when the expenditure is at a decreased level, otherwise, it is negative. The $\varepsilon_{i,h}$ present the error term.

5 Main Result

Before doing the research, I adopted 32669 random samples that the system provides. The final sample for regression models is 31,807. As shown in Table 2, the first three columns show the result of income and the last three columns show the result of expenditure. In addition, the following three lines under the chart orderly express total observations, fitting degree, and fitting degree after adjusting.

First, column (1) illustrates the relationship between total income and risk level without adding any control variables, The risk level improves by 0.0008 with the increase of every 1000yuan in the family income and with a standard error maintains of 0.0001. The coefficient is significant at the level of 1%. R^2 equals 0.0015 and Adj R^2 equals 0.0014 also displays the fitting extent is at the normal level. It illustrates that 0.15% of the variation in risk preference can be explained by total family income. Subsequently, in column (2), control variables, such as age, gender, and others, are added to the model. The coefficient decreases from 0.0008 to 0.0005 under the circumstance of adding some covariables, with the standard error of no changes. The coefficient is still significant at the 1% level, implying our estimates of the coefficient are robust to adding control variables. However, the new R^2 and Adj R^2 doubled to about 0.06, meaning the fitting degree was better than before. In column (3), on the top of covariates, we clustered the standard errors to the household level to allow risk preference correlation among people in the same household. The results are similar to those in column (2) except for the standard error, which further confirms the robustness of our estimate. In short, the original model, with the new covariates, becomes more stable.

The estimates of control variables also indicate their relationship with risk preference. As far as the party is concerned, compared to a person who has no party, a party member's risk preference is 0.0008 higher, holding other variables constant. The estimate is significant at the level of 10%, and the standard error is also lower, with 0.0041. According to the data on Gender, the consequence is clear that males are more 0.2392 than females in the risk preference and its estimate is significant at the level 1% whereas its standard error reaches the largest of 0.0200 in all covariables Moreover, the coefficient at the risk level for these people who are not students is larger 0.0108 than students. The above are covariables with a positive coefficient. The negative coefficient means that risk

Table 2. Main results

	<i>Risk level</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
Family income (in 1,000yuan)	0.0008*** (0.0001)	0.0004*** (0.0001)	0.0005*** (0.0002)			
Family expenditure (in 1,000yuan)				0.0010*** (0.0002)	0.0005** (0.0002)	0.0005* (0.0002)
Gender		0.2392*** (0.0199)	0.2392*** (0.0200)		0.2390*** (0.0199)	0.2390*** (0.0200)
Age		-0.0233*** (0.0011)	-0.0233*** (0.0011)		0.0234*** (0.0011)	-0.0233*** (0.0011)
Party		0.0080* (0.0042)	0.0080* (0.0041)		0.0083 (0.0042)	0.0083** (0.0041)
Marriage		0.0221*** (0.0048)	0.0221*** (0.0051)		0.0222*** (0.0048)	0.0222*** (0.0051)
Student		0.0108*** (0.0028)	0.0108*** (0.0029)		0.0110*** (0.0028)	0.011*** (0.0029)
Habitation		-0.0086** (0.0077)	-0.0086** (0.0083)		-0.0080 (0.0077)	-0.0080 (0.0082)
N	31,807	31,807	31,807	31,870	31,870	31,870
R ²	0.0015	0.0672	0.0672	0.0013	0.0672	0.0672
Adj R ²	0.0014	0.0670		0.0013	0.0670	

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

tolerance decreases as the positive of the covariables. For example, in the line of age, the risk level declines by 0.0233 with the increase of everyone's age and with a standard error of 0.0011, holding other variables constant. Likewise, its estimate is significant at the 1% level. Similarly, people living in the city have less risk preference than rural people, with a 0.0086 value lower. Its coefficient is significant at the 5% level and with a standard error of 0.0083. The results of the survey on marriage are divided into three categories. These people who are divorced are more 0.0221 on the risk level than these people who are in the marriage. The coefficient is significant at the level of 1% and with the standard error of 0.0048, which means that marriage or not is also a strong relevant covariable.

In the rest three columns, the first one explains the regression relationship between the total family expenditure and risk level, without adding other control variables. The

risk level increases by 0.001 as the rise of every 1000yuan in expenditure and with the standard error of 0.0002. Both R^2 and $Adj R^2$ are the same value, with 0.0013, which illustrates that 0.13% of variates in risk preference can be explained by total family expenditure. In column (5), these covariates mentioned before, are also contributed to the spending model. The coefficient becomes one-half of the original value after adding some covariables, with 0.0005, and the standard error has no changes using robust standard error. Then, the coefficient is also significant at the level of 1%, implying our estimates are robust to adding control variables Compared with the covariables in the first three columns, every covariables have the analogical influence pattern for the risk level. However, the only difference is that there are people who lived is not significant for the model. It also said that this covariable is no longer crucial for my model.

In Table 2, we study how family total income and total expenditures affect people’s risk preferences. Now divide the total income and expenditures into different categories to study which category has the larger influence on risk preference. Details show in Table 3 and 4.

According to the previous analysis, we explored the influence of covariables, total expenditure, and income in detail. Furthermore, we expound on the influence of small categories of total income and expenditure. As shown in Table 3, if operational income increases by 1000yuan, the risk level will go up by 0.0005, with the standard error of 0.0002 and then, an estimate is significant at the level of 5%. Although the other three types of income also change by 0.0003, -0.0001 , and 0.0002 as the corresponding increase for income, their significance is not enabled to an ideal range. Wage income plays an important role in life. When the income improves by 1000yuan, people’s risk level ascends to 0.0007, and the standard error re to 0.0001, ‘***’ means that there is an intense correlation between risk level and wage income. Finally, only the operational income and wage income can be the main variables that affect risk preference in our model.

Table 3. Regression of income variables

	Risk level				
	(1)	(2)	(3)	(4)	(5)
Operational income	0.0005** (0.0002)				
Property income		0.0003 (0.0009)			
Transfer income			-0.0001 (0.0001)		
Other income				0.0002 (0.0007)	
Wage income					0.0007*** (0.0001)

(continued)

Table 3. (continued)

	Risk level				
	(1)	(2)	(3)	(4)	(5)
Age	-0.0234***	-0.0232***	-0.235***	-0.0233***	-0.0230***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Gender	0.2403***	0.2385***	0.2376***	0.2373***	0.2391***
	(0.0201)	(0.0200)	(0.0201)	(0.0199)	(0.0199)
Party	0.0090**	0.0093**	0.0095**	0.0095**	0.0074*
	(0.0042)	(0.0042)	(0.0042)	(0.0041)	(0.0042)
Marriage	0.0226***	0.0223***	0.0229***	0.0226***	0.0210***
	(0.0048)	(0.0048)	(0.0048)	(0.0048)	(0.0048)
Student	0.0111***	0.0117***	0.0113***	0.0113***	0.0108***
	0.0029	(0.0028)	(0.0029)	(0.0028)	(0.0028)
Habitation	-0.0071	-0.0067	-0.0075	-0.0065	-0.0096
	(0.0077)	(0.0077)	(0.0077)	(0.0077)	(0.0077)

Note: * means significance at 0.05 level

It can be seen from Table 4 that three variables satisfy our needs. First, medical spending is not significant at any level. Second, risk preference can decline by 0.0013 when a family input 1000yuan in the field of education and its standard error controls in 0.0032. Then, every 1000yuan invested in the business insurance spending could generate an improvement of 0.0036 for risk level. The other spending is more likely to influence the risk attitude than others, expounding that risk preference improves by 0.0056 while other spending increases by 1000yuan. These three variables' estimates are significant at the level of 5%.

As for the covariables, all of the covariables except inhabitation are significant to a certain extent in Table 3. In the first column, like the influence for total income, age's positive change will generate the decrease in risk level, with the value of 0.00234; females in risk level are less 0.2403 than males; party member exceeds 0.009 on risk level rather than regular people; divorced people have larger risk level, exceeding 0.0026 than these people are in marriage; non-students risk level is higher than students. Other columns in Table 3 and all covariables in Table 4 are similar across columns.

In a short, three out of four expenditures and other two income types are suitable for our model.

Table 4. Regression of expenditure variables

	Risk level			
	(1)	(2)	(3)	(4)
Medical spending (in 1,000yuan)	-0.0005 (0.0006)			
Educational spending (in 1,000yuan)		-0.0013** (0.0032)		
Business insurance spending (in 1,000yuan)			0.0036** (0.0015)	
Other spending (in 1,000yuan)				0.0056** (0.0024)
Age	-0.0233*** (0.0011)	-0.0235*** (0.0011)	-0.0233*** (0.0011)	-0.0234*** (0.0011)
Gender	0.2385*** (0.0199)	0.2380*** (0.0199)	0.2392*** (0.0199)	0.2387*** (0.0199)
Party	0.0094** (0.0041)	0.0096** (0.0042)	0.0087** (0.0042)	0.0092** (0.0041)
Marriage	0.0225*** (0.0048)	0.0227*** (0.0048)	0.0223*** (0.0048)	0.0225*** (0.0048)
Student	0.0114*** (0.0028)	0.0113*** (0.0028)	0.0111*** (0.0028)	0.0112*** (0.0028)
Habitation	-0.0063 (0.0077)	-0.0058 (0.0077)	-0.0076 (0.0077)	-0.0069 (0.0077)

6 Conclusion

With the development of society and the continuous improvement of currency, people have regarded assets as an inevitable part of our life, then the loss and derivation of money also influence people to behave. So, it is undoubted that people must take risks in order to acquire items that they want. Hence, taking risks can help people derive assets and further build relationship structure. Meanwhile, risk preference as a carrier is related to money.

In this paper, we first grade the risk level of 1–6 according to assisting data and choose several representative covariables to observe their influences on risk level. Thereafter, we have pointed out that a 1000yuan increase in total family income increases risk appetite by 0.008 and a 1000 yuan increase in total family expenditure increases risk appetite by 0.001 On this basis, we also classified income and expenditure and further research what kinds of income or expenditure have the primary influence on risk preference. Consequences present that business insurance spending, educational spending, other spending, and operational income are significant for our model.

In contemporary society, holding an indifferent attitude towards risk preference is not an available method because risk preference has arisen in our life everywhere. Investigating the relationship between risk and asset enables us to understand the determining factors adequately. Meanwhile, risk preference is related to other decisions in life. For example, government and community formulate the relevant policy, enabling them to predict the efficiency of the policy. As a manager, the final decision that you choose has responsibility for your group, relying on the risk preference to predict possible risk and judging the decision efficiency is especially crucial.

Limitation: it is clear that we only have CFPS's observations in our experiment, it has some unexpected surveying errors and systematic errors, such as the answering error and registering error, which possibly influence our outcomes. Moreover, the judgment for risk preference isn't their authentic operation but completely based on these answers of CFPS's observation. After all, it is difficult to synchronize theory with practice. Therefore, we can hold some real experiments in that people can be able to acquire money, which is a more accurate method for the measure of risk tolerance ability.

Appendix

Table 5. A1 Risk experiment 1 investigation

Experiment 1	Frequency	Percent	Cum.
Refuse to answer	45	0.14	0.14
No idea	465	1.42	1.56
Get \$100 directly	24,344	74.52	76.08
50% to get \$200, 50% to get \$0	7,814	23.92	100.0
Total	32,669	100.00	

Table 6. A2 Risk experiment 2 investigation

Experiment 2	Frequency	Percent	Cum.
	8,325	25.48	25.48
Refuse to answer	4	0.01	25.50
No idea	29	0.09	25.58
Get \$80 directly	21,170	64.80	90.39
50% to get \$200, 50% to get \$0	3,141	9.61	100.00
Total	32,669	100.00	

Table 7. A3 Risk experiment 3 investigation

Experiment 3	Frequency	Percent	Cum.
Unsuited	11,499	35.20	35.20
Refuse to answer	1	0.00	35.20
No idea	19	0.06	35.26
Get \$100 directly	17,569	53.78	89.04
50% to get \$200, 50% to get \$0	3,581	10.96	100.00
Total	32,669	100.00	

Table 8. A4 Risk experiment 4 investigation

Experiment 4	Frequency	Percent	Cum.
Unsuited	24,855	76.08	76.08
Refuse to answer	2	0.01	76.09
No idea	11	0.03	76.12
Get \$120 directly	1,945	5.95	82.07
50% to get \$200, 50% to get \$0	5,856	17.93	100.00
Total	32,669	100.00	

Table 9. A5 Risk experiment 5 investigation

Experiment 5	Frequency	Percent	Cum.
Unsuited	26,813	82.07	82.07
No idea	1	0.00	82.08
Get \$150 directly	1,707	5.23	87.30
50% to get \$200, 50% to get \$0	4,148	12.70	100.00
Total	32,669	100.00	

References

1. Brown S, Ortiz A, Taylor K. Educational attainment and risk preference[J]. 2006.
2. Engelmann J B, Tamir D. Individual differences in risk preference predict neural responses during financial decision-making[J]. Brain Research, 2009, 1290: 28-51.
3. Holt, C. A., and Laury, S. K. Risk aversion and incentive effects, American Economic Review, 92(2002), 1644–55.
4. Dohmen, Thomas, et al. “On the relationship between cognitive ability and risk preference.” Journal of Economic Perspectives 32.2 (2018): 115–34.

5. Shiller R J. Macro markets: creating institutions for managing society's largest economic risks[M]. OUP Oxford, 1994.
6. Bernstein D P. Economic factors, attitudes towards risk, and health insurance coverage for young adults[J]. *Attitudes Towards Risk, and Health Insurance Coverage for Young Adults* (May 14, 2009),
7. Condliffe S, Fiorentino G T. The impact of risk preference on health insurance and health expenditures in the United States[J]. *Applied Economics Letters*, 2014, 21(9): 613-616.
8. Rogers, A.R. Evolution of time preference by natural selection. *Am. Econ. Rev.* 84(1994): 460–481
9. Daly, M. & M. Wilson. Crime and conflict: homicide in evolutionary psychological perspective. *Crime Justice* 22(1997): 51–100.
10. Mata R, Josef A K, Samanez-Larkin G R, et al. Age differences in risky choice: A meta-analysis[J]. *Annals of the New York Academy of Sciences*, (2011), 1235(1): 18-29.
11. Tymula, Agnieszka, Lior A. Rosenberg Belmaker, Lital Ruderman, Paul W. Glimcher, and Ifat Levy. 2013. "Like Cognitive Function, Decision Making across the Life Span Shows Profound Age-Related Changes." *PNAS* 110(42): 17143–48
12. Jaeger, D. A., T. Dohmen, A. Falk, D. Human, U. Sunde, and H. Bonin. Direct evidence on risk attitudes and migration. *The Review of Economics and Statistics*, 92(3):684689, (2010)
13. Bauernschuster, S., O. Falck, S. Heblich, J. Suedekum, and A. Lameli. Why are educated and risk-loving persons more mobile across regions? *Journal of Economic Behavior & Organization*, 98(2014):5669,
14. Knowles, J., & Postlewaite, A. (2005). Do children learn to save from their parents? *Population Aging Research Centre (PARC) Working paper series, WPS 05–07(2005)*, University of Pennsylvania.
15. Reynolds et al., 2009B. Reynolds, K. Leraas, C. Collins, S. Melanko Delay discounting by the children of smokers and non-smokers Drug and Alcohol Dependence, 99 (2009), pp. 350–353
16. Kosse and Pfeiffer, 2012 F. Kosse, F. Pfeiffer Impatience among preschool children and their mothers *Economic Letters*, 115, 2012, pp. 493–495
17. Youniss J, Smollar J. Adolescent relations with mothers, fathers and friends[M]. University of Chicago Press, 1987
18. Ma Guangrong&Zhou Guangsu, 2014 The Impact of New Rural Endowment Insurance on Family Savings: A Study Based on CFPS Data *Economic Journal of Research*
19. Su huashan, Lv Wenhui&Zhang Yunfeng. Influence of Unmarried Family Members on Household Savings Rate *Economic Science Journal* (2016)
20. Sheng Weiyan and Hu Qiuyang, 2019 Cognitive ability, non-cognitive ability and skill premium — An empirical study based on the micro-data of CFPS from 2010 to 2016, *Shanghai economic research* 2019(04)
21. Cheng Gongshu&Lin Liqiong, 2020. Cognitive ability, relationship and family financial investment decision, *Learned Journal*
22. Zhou Guangsu, Fan Gang, Shen Guangjun, 2014, Income Gap, Social Capital, and Health Level, *Managing the World*, Issue 7, 2014:
23. Xiong Ruixiang&Li Huiwen, Child Care, Public Service and Rural Married Women's Non-agricultural Employment, *China Economic (quarterly)* Vo 1. 16, No.1 October 2016
24. Ayhan, Sinem H., Kseniia Gatskova, and Hartmut Lehmann. "The impact of non-cognitive skills and risk preferences on rural-to-urban migration in Ukraine." *Journal of Comparative Economics* 48.1 (2020): 144-162.

25. Chaulk, Barbara, Phyllis J. Johnson, and Richard Bulcroft. "Effects of marriage and children on financial risk tolerance: A synthesis of family development and prospect theory." *Journal of Family and Economic Issues* 24.3 (2003): 257-279.
26. Mata R, Frey R, Richter D, et al. Risk preference: A view from psychology[J]. *Journal of Economic Perspectives*, (2018), 32(2): 155-72.
27. Dayton-Johnson J, Bardhan P. Inequality and conservation on the local commons: A theoretical exercise[J]. *The Economic Journal*, 2002, 112(481): 577-602.

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