Household Financial Behaviour and Economic Decisions

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Abstract

This thesis explores the role of income expectations, housing demolitions, and financial literacy in determining household financial and consumption decisions based on three popular nationally representative datasets of Chinese households. There are three empirical chapters, mainly providing empirical evidence to the existing literature on household finance.

Chapter 2 investigates the role of income expectations in shaping household financial and consumption decisions based on cross-sectional data from the 2002 wave of the Chinese Household Income Project (CHIP), containing information on urban, rural and migrant households. The primary explanatory variables are a set of income expectation dummies representing optimistic households expecting higher future household income, neutral households expecting no changes, and pessimistic households expecting lower household income, measuring subjective household expectations of their household income in five years. The empirical results indicate that there is a relationship between income expectations and the holdings or amounts of household assets, debt and consumption for urban households, a relationship between income expectations and household financial assets for rural households, and a relationship between income expectations and household assets and consumption for migrant households.

Chapter 3 examines the impacts of housing demolitions on household financial and consumption decisions mainly based on balanced panel data from the waves 2013 and 2017 from the China Household Finance Survey (CHFS). In China, households have little control over the events of housing demolitions. A quasi-natural experiment approach is adopted, with the treatment group comprising demolished households and the control group comprising non-demolished households. This dataset provides detailed data on household financial assets, debt, and household consumption of different subcategories. Therefore, this chapter can explore the impacts of housing demolitions on household

financial and consumption decisions using a difference-in-difference methodology. The empirical results indicate a positive causal relationship between housing demolitions and household education debt in the logarithmic form and a negative causal relationship between housing demolitions and household consumption on bills and property management fees, housing maintenance, and household travelling. Nevertheless, no causal impacts are found in household financial assets, other household debt categories, and other household consumption categories.

Chapter 4 examines the impacts of basic and advanced financial literacy on household financial and consumption decisions based on unbalanced panel data from the waves 2010, 2012, 2014, 2016, and 2018 of the China Family Panel Studies (CFPS). Basic financial literacy is measured by the number of correct answers to financial literacy survey questions regarding interest rates, inflation rates and risk diversification (the Big Three framework). Advanced financial literacy is measured by the number of correct answers to financial literacy answers regarding financial markets. Both financial literacy variables, basic and advanced, are standardised for comparison. This empirical chapter estimates three sets of models containing only basic financial literacy, only advanced financial literacy, and both basic and advanced financial literacy using random effects Tobit or Generalised Least Squares (GLS) methodologies. In Chapter 4, to solve the endogeneity problems of two endogenous variables, basic and advanced financial literacy, this chapter uses the average basic financial literacy at the county level to instrument basic financial literacy and the average advanced financial literacy at the county level to instrument advanced financial literacy. The empirical results suggest heterogeneous impacts of basic and advanced financial literacy on household financial and consumption outcomes.

Declaration

I certify that the thesis I have presented for examination for the PhD degree of the University of Sheffield is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I warrant that this authorisation does not, to the best of my belief, infringe the rights of any third party.

I declare that my thesis consists of approximately 112811 words.

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Chapter 1

Introduction

1.1 Motivation and Aims

Recently, some stylised facts regarding household finance in China can be seen in public media. For example, an article from *Financial Times* reports that Chinese household savings have reached an all-time high in the year 2022, but Chinese households are not willing to consume for many reasons (e.g., precautious motives and low financial expectations), leading to a small proportion of household savings expected to be deployed through consumption in the following year (Leng and Lockett, 2023). In *China Daily*, an article points out that boosting domestic consumption is vital for China to keep a fast track of economic development and build a consumption-driven economy (Bian, 2023). Such stylised facts motivate this thesis to explore the determinants of household financial and consumption decisions in China. For a researcher, household finance research based on representative data helps provide deeper insights and more reliable empirical evidence.

One main challenge of conducting research on household finance studying actual household behaviours is the need for high-quality representative data (Campbell, 2006). This thesis uses three different data sources to conduct empirical analysis. The first dataset used in Chapter 2 is the Chinese Household Income Project (CHIP), with the first wave collecting the information of respondents in 1988 being the CHIP 1988, followed by the CHIP 1995, 2002, 2007 and 2013. The institutions responsible for different waves of the CHIP datasets vary across different waves, and only the CHIP 2002 dataset includes information on household income expectations. These factors are two main reasons why Chapter 2 uses cross-sectional data from the CHIP 2002. The second dataset used in Chapter 3 is the China Household Finance Survey (CHFS) conducted every two years, organised by the Survey and Research Center for China Household Finance of the Southwestern University of Finance and Economics (Gan *et al.*, 2013). The third dataset used in Chapter 4 is the China Family Panel Studies (CFPS) conducted every two years by the Institute of Social Science Survey (ISSS) of Peking University.

1.2 Structure and Content of the Thesis

1.2.1 Chapter 2

The topic of Chapter 2 is the role of income expectations in household financial and consumption decisions measured by the ratios of outcomes to total household income of the year 2002. This chapter starts with some stylised facts in China, including high household savings ratios with respect to household income compared with some other countries, low household consumption-to-output ratios, and rapid growth of household debt. Whereafter, Chapter 2 introduces important sources of uncertainties faced by Chinese households after the nationwide reforms of state-owned enterprises (SOEs) and pension systems. These reforms profoundly influence household financial and consumption decisions (Zhu and Walker, 2018; He *et al.*, 2018; Seeborg *et al.*, 2000).

There are some classical models explaining household savings and consumption. The Keynesian models reveal that household savings are exclusively determined by current income (Friedman and Becker, 1957). The life cycle models assume that households save to smooth consumption over the life cycle (Modigliani and Brumberg, 1954; Modigliani and Cao, 2004). Under the permanent income hypothesis, households change their consumption in response to unexpected income shocks (Friedman, 1957; Hall, 1978; Morley, 2007). Inspired by these traditional models, this chapter includes household permanent income and income expectations to explore their role in determining household financial and consumption decisions and to see whether household decisions are influenced by other income components except for current income.

The income expectation variable is constructed based on the answers to a survey question asking respondents to predict their household income in five years. Based on the answers, all observations are divided into three groups: optimistic households expecting higher future household income in five years, neutral households expecting no changes in five years, and pessimistic households expecting lower household income, measuring household subjective expectations of their household in five years.

Furthermore, this chapter adopts two alternative approaches to obtaining household permanent income. The first method is a statistical method through calculating the mean of the realisation data of household income (history data). The second method is an econometric method of estimating household permanent income using a Mincer-type methodology.

Considering data availability, the outcome variables used in this chapter are household asset-to-income ratios, household debt-to-income ratios, and household consumption-to-income ratios (total, durable and nondurable). The asset-to-income ratios and the debt-to-income ratios measure household financial resources and financial burden as a percentage of total household income, respectively. The consumption-to-income ratios measure household relative consumption levels with respect to total household income. Finally, this chapter adopts a Tobit methodology for models with censored dependent variables (i.e., asset-to-income ratios and debt-to-income ratios) and an OLS methodology for models with continuous dependent variables (i.e., consumption-to-income ratios for total consumption, durable consumption, and nondurable consumption). This chapter obtains the estimation results for household assets, debt and consumption for urban, rural, and migrant households separately.

Empirical results suggest that income expectations differ in influencing household financial and consumption decisions. Neutral urban households expecting no changes in future income have a lower probability of having positive financial assets. They also have higher consumption (total, durable and nondurable) as a proportion of household income than optimistic households expecting higher future income. Pessimistic urban households, on average, have a higher probability of being indebted. Additionally, they have higher amounts of consumption (total, durable and nondurable) as a proportion of household income and higher debt ratios with respect to household income conditional on being uncensored than optimistic households.

Only a correlation between income expectations and household assets is found for rural households. In detail, pessimistic households in rural areas have a higher likelihood of having household financial assets and have higher amounts of financial assets conditional on having any financial assets. Lastly,

for migrant households, neutral households have a lower probability of having any financial assets and then hold lower financial assets with respect to annual household income, conditional on being uncensored, compared with optimistic households. Besides, pessimistic migrant households have smaller consumption-to-income ratios, indicating that a smaller proportion of annual household income is spent on consumption (durable and nondurable).

1.2.2 Chapter 3

The topic of Chapter 3 is the impacts of housing demolitions on household financial and consumption decisions, including household financial asset allocation decisions, household debt decisions and household consumption decisions. The large-scale housing demolitions have been accompanied by rapid Chinese urban expansion in recent decades. The uniqueness of housing demolitions in the context of China stems from the separation of land ownership and use rights (Shi, 2015; Zhao and Liu, 2022; Wang *et al.*, 2023). Thus, local authorities have monopoly power in housing demolition (Zhao and Liu, 2022). Because households have little control over housing demolitions, housing demolitions can be regarded as exogenous shocks.

This chapter treats housing demolitions as external shocks of a quasi-natural experiment with demolished households in the treatment group and non-demolished households in the control group. Due to data limitations, this chapter proposes a novel method of constructing balanced panel data by setting a four-year fixed time interval, even if the datasets are conducted every two years. Details can be found in Section 3.3.1. The treatment variable identifies households that experienced at least one housing demolition between 2013 and 2017. The time variable equals 1 for observations from the CHFS 2017 and 0 for CHFS 2013 as a time indicator. The inclusion of the treatment variable, the time variable and the interaction between the treatment and time variables makes it possible to identify a causal relationship between housing demolitions and household financial and consumption decisions with a difference-in-difference methodology.

There are three sets of dependent variables in this chapter, including (1) the financial asset composition as ratios of different financial assets with respect to total financial assets, (2) the logarithm of different debt categories (housing debt, vehicle debt, education debt and credit card debt), and (3) the consumption-to-income ratios regarding different consumption categories. This chapter applies a random effects Tobit methodology for models with limited outcome variables and a random effects GLS methodology for models with continuous variables for balanced panel data. For asset and debt models, this chapter uses a random effects Tobit methodology for balanced panel data. For consumption models, this chapter uses a random effect GLS methodology for the consumption-to-income ratios regarding food, housing (i.e., bills and property management fees), daily necessities, and telecommunication. This chapter adopts a random effects Tobit methodology for the consumption-to-income ratios regarding family services, transportation, entertainment, housing maintenance, education, and travelling.

The empirical results of the asset equations suggest that no causal relationship is founded between housing demolition and households' allocation of financial resources in different assets. For household debt, the causal relationship is only found between housing demolitions and education debt. For household consumption, the causal effect of housing demolitions is found in the consumption on housing (e.g., bills and property management fees), housing maintenance, and travelling. All empirical results of this chapter provide new evidence of the impacts of housing demolition in the field of household finance for Chinese residents.

1.2.3 Chapter 4

Chapter 4 investigates the impacts of basic and advanced financial literacy on household financial and consumption decisions. Financial literacy reflects household capabilities of dealing with economic information and making economic decisions, which are extremely important with the rapid

development of financial instruments and technology (Lusardi and Mitchell, 2014; Huston, 2010; Jappelli and Padula, 2017; Bucher-Koenen and Lusardi, 2011; Lusardi and Mitchell, 2017). Following the evaluation methods used by Lusardi and Mitchell (2009) and Li *et al.* (2020), this chapter constructs basic and advanced financial literacy indicators based on the number of correct answers to basic financial literacy questions and advanced financial questions.

The five basic financial literacy questions are regarding (1) the deposit interest rate for one-year fixed-term deposits, (2) numeracy (interest compounding for one year), (3) interest compounding for an additional year, (4) inflation rates, and (5) the time value of money respectively. These questions are basic in day-to-day activities. At the same time, the eight advanced financial literacy questions are regarding (1) the relationship between return rates and risks, (2) the comparison of the risks of stocks and funds, (3) the central bank, (4) the comparison of the risks of different financial products, (5) the understanding of stocks, (6) the understanding of mutual funds, (7) the understanding of bank financial products, and (8) the core function of the stock market. The eight questions are more relevant to participation in financial markets and knowledge of financial products.

Basic and advanced financial literacy are potentially two endogenous independent variables due to reverse causality, omitted variables, and measurement errors. Even if the endogeneity problem of financial literacy is less serious in countries or districts where there are less developed financial markets or there is a lack of existing financial education programs (Klapper *et al.*, 2013), this chapter attempts to use average basic and advanced financial literacy at the county level to instrument endogenous basic and advanced financial literacy following Li and Qian (2020). Random effects Tobit and GLS techniques are used to estimate the results of models with and without instrumental variables.

The estimated results of baseline models suggest that there is a positive relationship between both basic and advanced financial literacy and different household assets and a negative relationship between basic financial literacy and household debt, housing debt and non-housing debt. For household consumption, apart from education and entertainment consumption, both basic and advanced financial literacy have

a positive impact on absolute consumption in the logarithmic form and a negative impact on the relative consumption with respect to household income, when basic and advanced financial literacy exert influence on specific outcomes. The empirical analysis under the IV estimation provides ambiguous results for the impacts of basic and advanced financial literacy on household asset and debt decisions.

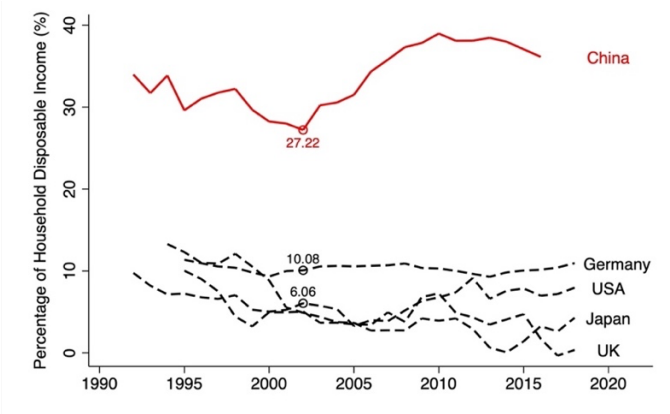
Chapter 2

The Impact of Financial Expectations on Household Financial and Consumption Decisions: Evidence from China

2.1 Introduction and Motivation

The whole world witnessed the rapid economic development of China during the past forty years after the 1978 reform and opening-up policy. During that period, extraordinarily high saving rates are thought to be one of the main economic drivers of remarkable economic growth (Lean and Song, 2009; Li *et al.*, 2012; Zhou and Zhang, 2016). As Figure 2.1 shows, the saving-to-income ratio at the household level jumped from 27.22% in 2002 to approximately 40% in 2010, then decreased slightly and remained at a relatively high level compared with other countries (i.e., Germany, the USA, the UK, and Japan).[1] The astonishing saving rate gap between China and the US is narrowed, but the difference does not disappear after using more comparable household saving rates across different countries (Qin and Ren, 2008).

Figure 2.1 Total household savings (% of household disposable income)

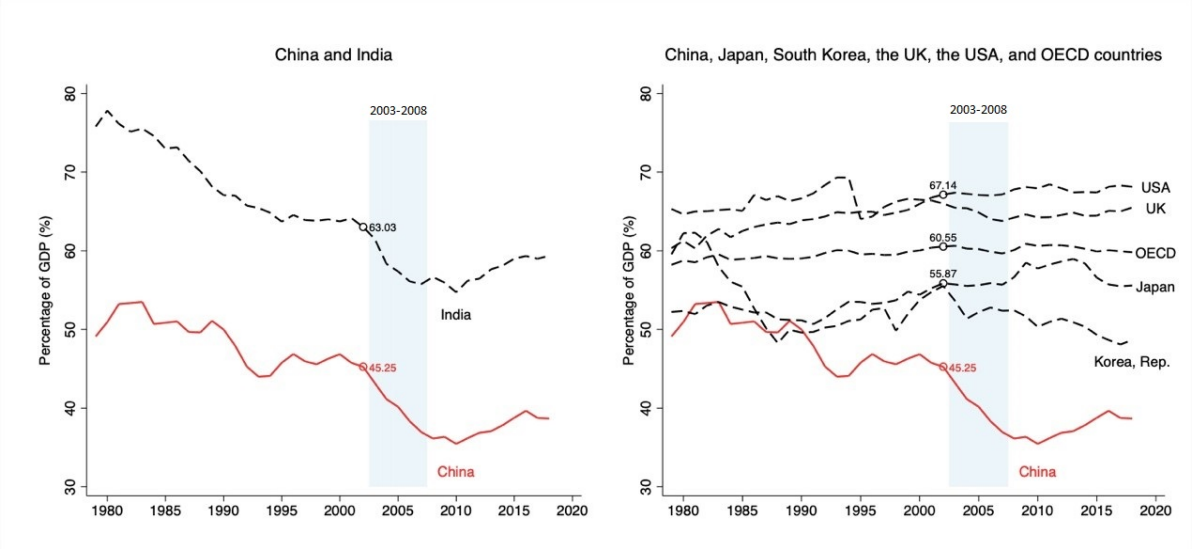


Source: OECD National Accounts at a Glance (OECD, 2020)

Notes: The figure shows the share changes of five countries over time. For China, the share of total household savings to total household disposable income gradually decreased before the year 2002; after that year, the proportion increased rapidly from 27.22 % in 2002 to 38.99% in 2010. The Chinese share is significantly higher than other countries (listed). The rising pace picked up noticeably in the first ten years of the 2000s. See Aziz and Cui (2007) for a detailed comparison.

[1] Due to the differences in concepts and measurements across different countries, Qin and Ren (2008) choose reliable resources and adjust the calculation of personal savings for China and the US to make them comparable. Besides, given that Japan is an Asian developed country with a similar culture to China, this country is often used to compare with China. It is noticeable that, during the 1970s, there was a peak with household saving rates being over 20% as a percentage of household disposable income (Saito, 2022). However, after a small peak, the saving rates gradually decreased, even reaching zero and negative values.

Figure 2.2 Households and NPISHs final consumption expenditure (% of GDP)



Source: World Bank National Accounts Data, and OECD National Accounts Data Files (World Bank, 2020)

Notes: This figure illustrates the trend in China's proportions of households and non-profit institutions serving households (NPISHs) final consumption expenditure to the Chinese annual Gross Domestic Product (GDP) between 1978 and 2019, in comparison with the tendency of other countries. The expenditure shares of China were relatively low when compared with the shares of one Asian developing country (India) and four OECD countries (including two Asian developed countries) during the same period. As the figure shows, the share of China decreased rapidly from approximately 60% to around 40% in the past 40 years. The decline is most evident for the period 2002-2008. See Aziz and Cui (2007) for further information.

In addition to the remarkably high savings rates, the noticeable features are the low shares of household consumption and debt relative to the Gross Domestic Product (GDP). The consumption-to-output ratio of Chinese households was less than 45% at the beginning of the 2000s and then decreased to approximately 33% at the year of 2010, followed by a slight increase, while during the same period, the past two decades of this century, the average ratio of the OECD countries was around 60% (see Figure 2.2). Even though China had similar trends in the national share of household consumption in GDP with India, another large developing country, China's consumption share was much lower, which is consistent with the finding of Qi and Prime (2009).

Turning to the debt-to-output ratio, according to data from the Bank for International Settlements, the ratio of Chinese household debt to GDP kept increasing from around 10% in 2006 to 57% in 2020.[2] From the datasets used in this chapter, the indebted households in urban areas account for 15% of the total urban households and the rural households account for around 21.9% of the total rural households. Based on the Survey of Chinese Consumer Finance and Investor Education (SCCFIE) data, only a small proportion of Chinese households are indebted, with an average outstanding household debt equalling $15,400 (Liao *et al.*, 2010). There are three remarkable features for Chinese households: high household saving rates of total disposable income, low household consumption, and low shares of indebted households.

Concerning household consumption at the aggregate level, the reduction is remarkable in the first decade of this century. Figure 2.2 shows that the private consumption ratios have declined remarkably and continuously since the late 1990s. This feature is shared by China and India, the two largest developing countries. The time trend shows that it is noticeable for these two developing countries at initial development stages to experience a decrease in consumption ratios. The magnitude, however, is of great interest in the case of China, owing to its notably lower consumption ratios compared to India. This chapter uses information on subjective income expectations at the household level to address the concern about the relationship between expected income growth and households' financial and consumption decisions better to understand the financial and consumption behaviours of Chinese households.

This chapter provides an empirical investigation on the role of subjective income expectations in determining household consumption behaviours (the expenditure-to-income ratios, the durable-to-income ratios and the nondurable-to-income ratios) and the household financial behaviours (the asset-to-income ratios and the debt-to-income ratios). This chapter employs the 2002 wave of the Chinese

[2] See the detailed information from the Bank of International Settlements website: http://stats.bis.org/statx/srs/table/f3.1.

Household Income Projects (CHIP), which contains a subjective survey question asking respondents to provide their income expectations for an interval of five years. Thus, this chapter can construct an income expectation variable revealing household perceptions of their income levels in five years to complete this empirical study on the relationship between income expectations and household financial and consumption decisions.

Income expectations play an important role in life-cycle models, which indicate that household income expectations determine current-period savings and consumption through smoothing consumption (Brown and Taylor, 2006; Dominitz, 2001). The standard inference of life-cycle models is that individuals and households make savings and dissavings decisions based on the discounted value of future income over the entire life cycle, highlighting the role of future outlook (Nagatani, 1972). Therefore, household decisions reflect future income expectations, which are assumed to be associated with expected income realisation (Marcel and van Soest, 1997). This chapter hypothesises that household income expectations affect relative holdings of liquid assets, household debt, and household consumption decisions with respect to total household income. These outcomes of interest are evaluated using ratios of household financial assets, household debt, and household consumption (total, durable and nondurable). In detail, the following hypotheses are formulated:

H1: Income expectations have an impact on household holdings and amounts of financial assets as ratios with respect to total household income.

H2: Income expectations play a role in determining the probability of being indebted and the amount of household debt with respect to total household income conditional on having positive debt.

H3: Income expectations influence total household consumption, durable consumption and nondurable consumption with respect to total household income.

Due to the heterogeneous distributions of the asset-to-income, debt-to-income, and consumption-to-income ratios, this chapter adopts different estimation approaches for different outcome variables. The asset-to-income and debt-to-income ratios are censored at the value of zero. Thus, this chapter adopts a Tobit methodology for the asset-to-income and debt-to-income models. Given that the consumption-to-income ratios are continuous in the sample, this chapter uses an Ordinary Least Square (OLS) methodology to fit the consumption models. The empirical results suggest that income expectations have different roles in household holdings of assets, debt, and consumption for different households (urban, rural, and migrant).

For the rest of this chapter, Section 2.2 reviews previous literature about financial expectations. Section 2.3 describes the institutional background, introduces the datasets used in this chapter, and presents a detailed description of the dependent variables and explanatory variables in the empirical analysis. Empirical strategies and empirical results are discussed in Section 2.4. Finally, Section 2.5 makes a short conclusion and discussion based on the empirical findings.

2.2 Literature Review

2.2.1 China's specific sources of uncertainties

Chinese household saving ratios, based on the national account data, are higher than the results obtained from the household survey data, partially due to the definition issues (Deaton, 2005), the information-collecting biases, and the sample selection problem (i.e. under-sampling). Even with such systematic discrepancies, the increasing tendency and high magnitude of household saving rates are unchanged. Chamon *et al.* (2013) use the survey data to describe the trend and find the same features of the aggregate household saving rates for both urban and rural households in China.

The current literature has explored many influential factors capable of explaining the continuous increase in the share of household savings with respect to household disposable income (Cristadoro and Marconi, 2012; Chamon *et al.*, 2013; Kraay, 2000; Chamon and Prasad, 2010). One explanation is the precautionary motives to deal with increasingly unpredictable future conditions caused by idiosyncratic policy shocks (Chamon and Prasad, 2010) – higher uncertainties on employment, pension attainments, health equity, education benefits and many other socioeconomic aspects after the profound nationwide reforming in the 1990s (especially the privatization and restructuring of the state-owned enterprises, and the changes of pension policies).[3]

The Chinese-style reforms of the state-owned enterprises (SOEs), different from the reforms of Eastern European and the former Soviet Union, were a national policy to transform the country from a planned economy to a market economy progressively; in the transitional process, millions of workers lost their

[3] According to the 1997 pension reform, the new pension arrangements are applied to the employees retiring after the year 1997 while compensating the existing workers for the policy shocks after retirement (with no compensation for new workers). Workers are required to share heavier individual responsibilities but receive fewer pensions based on local wage levels. For details on the pension reform (or the old age insurance system reform), please refer to Sin (2005) and He *et al.* (2008). The latter uses the same data source of this chapter and finds that there were massive decreases in the pension wealth of different age groups after the 1997 pension reform; for the female group of age 25, the magnitude even reached 65.45%.

jobs ("Tie Fan Wan", also known as the iron rice bowl) and had to find new jobs mainly in the service sector, called the laid-offs ("Xiagang") and re-employment ("Zaijiuye") of the excess employment (see Cao *et al.* (1999) and He *et al.* (2018) for the statistics and analysis). Guo and N'Diaye (2011) also illustrate the growth of short-term employment uncertainty in the progression stage to build a more consumption-oriented economy with more labour forces, especially the low-skilled, entering the domestic non-tradable sector. Due to the economic reshaping, the direct outcome was that people involved in the reform lost their lifelong stable work and did not receive generous benefits (i.e., fully covered medical expenses and pension insurance) as a member of the SOEs anymore.

Apart from the changes in the state enterprises, the pension reform is another important source of future income uncertainty. The direct impact is that the replacement ratios, the amounts of pensions after retirement over the pre-retirement average wages, decreased after the radical change of Chinese old-age insurance policy from the traditional pay-as-you-go (PAYG) system to the combination of the public PAYG pensions ("Social pooling") and the individual account pensions.[4] The reduction in size for different groups retiring at different ages ranged from 15.3% to 23.3% (for details about the policy reform introduction, the size of replacement ratio reduction, etc., see Sin (2005)).[5] The measured magnitude of pension replacement ratios relates to the assumptions that the authors make, the groups and scenarios they choose and the calculation methods they use. He *et al.* (2008) use the Chinese Household Income Project (CHIP) datasets of the year 1995, 1999 and 2002, the same data source used in this chapter, finding that the results derived from the household surveys suggest that the replacement ratios of both females and males decreased sharply for all age groups. The authors also find that household saving rates are negatively and significantly influenced by household pension wealth. Actually, pension contributions can be regarded as alternatives to deposits, deposited when individuals are young and withdrawn when retired, and they have substitution effects mutually.

[4] Individual account pensions can be partially, fully (100%), or even excessively (higher than 100%) funded. The amounts of contributions are determined by individuals. Higher contributions mean higher pension benefits after retirement, resulting in higher inequity.

[5] The percentage of the reduction in pension benefits differs in research. This chapter uses the estimated results of the World Bank document.

The massive socioeconomic reforms in China can partially explain the extraordinarily high precautionary saving motives of Chinese households. Although the reforms continuously influenced the whole of Chinese society, it is worth noting that citizens in urban areas were influenced more by the conversion from plan to market than those in rural districts (Du, 2009). Taking rural households as an example, only around 5% of all rural non-agricultural employers worked for state-owned enterprises or institutions (from the records of the datasets used in this chapter), and more than 90% of unemployed elders in the rural areas did not have any support from pension systems after retirement, mainly supported by their families, according to the 2000 census (Dewen, 2006). This means that even with drastic reforms, the number affected in the rural population is relatively limited.

One possible interpretation of the distinction between urban and rural households is the hukou system. This household registration system records the residential location (the administrative unit) and the socio-economic type (urban or rural) of each Chinese mainland citizen (see Chan and Zhang (1999) and Chan and Buckingham (2008) for the development of the hukou system). Before the transition, individuals with urban hukou were the direct beneficiaries of previous social arrangements with highly subsidised cradle-to-grave benefits from their employers in many aspects, i.e., pensions, education, and medical care (Ding *et al.*, 2000). Partially for this reason, the common practice of studying household financial behaviours in the Chinese mainland is to divide the whole population into three categories, the urban, the rural and the rural-to-urban migrant. This chapter focuses on 2002, when modern pension systems were not completely established for rural residents. The new pension system for rural areas formally started in 2009 (Shen and Williamson, 2010). Thus, it is reasonable to find the differences among different groups. Overall, the ultimate root cause of such classification is the urban-rural dichotomy, also called the dual urban-rural structures, leading to the fundamental differences between the urban regions and the rural regions. The divergence would not disappear without the elimination of these political arrangements (Han, 2006).

The thorough top-down reforms resulted in drastic changes and considerable uncertainties in every aspect of Chinese society, especially those previously working for the SOEs.[6] As they were faced with increasing unemployment risks (i.e., from lifelong contracts to contractual relationships, see Zhu and Walker, 2018), higher education costs and medical expenditures (near-free before the reforms, see He *et al.*, 2018), lower old-age insurance (as discussed above) and other uncertainties in any socioeconomic aspects stemming from the remarkable transition to a more market-oriented market. In light of this natural experiment in the 1990s, He *et al.* (2018) use the identical data source of this chapter, finding that residents, consequently, needed to enhance their precautionary savings to address adverse shocks. Even for the rural residents, for whom family supports were the primary source of old-age life (Dewen, 2006) and fewer SOE workers (as discussed above), they also had to face tremendous socioeconomic changes; for example, along with the privatization of many SOEs and the appearance of new enterprises, more rural migrants left the rural districts and worked in the urban cities or towns (Seeborg *et al.*, 2000).

2.2.2 Classical models explaining household decisions

A large number of theoretical and empirical studies have been undertaken to explore the saving behaviours of Chinese households (see Modigliani and Cao, 2004; Horioka and Wan, 2007; He *et al.*, 2008; Brugiavini *et al.*, 2012; Cristadoro and Marconi, 2012; Chamon *et al.*, 2013 and so on). As previously outlined, Chinese households exhibit an exceptionally high propensity to save according to international benchmarks and historical precedent. Due to a lack of appropriate and credible microdata at the household level at the beginning of this century, most research deals with the impacts of macroeconomic variables on aggregate household saving rates.

[6] These reforms do not exclusively refer to state enterprise restructuring and pension reforms. They are thought to be two of the most recent and prominent policies at that time; however, many other policies like the one-child policy and many events like obtaining the WTO membership have far-reaching influences on the whole society. Nevertheless, the two main reforms are widely discussed in household saving research.

Current macro-level literature shows that household saving behaviours can be explained by economic growth and inflation (Modigliani and Cao, 2004), future income (Kraay, 2000), population age structure (Horioka and Wan, 2007), demographic structure at the country level (i.e., the working fraction of the whole society) (Modigliani and Cao, 2004), inflation rates (Jongwanich, 2010), interest rates (Beznoska and Ochmann, 2013) and so on.[7] [8] Looking back to the market-oriented economic reforms, nearly all the influencing factors were potentially changed as reform proceeded. As Figure 2.1 shows, the timing of the turning points in the variation of the household saving rates reveals the possible underlying changes of these determinants.

Gradually, with more micro-level data, the determinants of household financial behaviours can be analysed at the household or even individual level. Fundamentally, there are several traditional equilibrium models, including the Keynesian models and the predominant life cycle/permanent income models.[9] The hypothesis of the life cycle model was developed by Modigliani and Brumberg (1954), and the core assumption is the intertemporal consumption smoothing (Modigliani and Cao, 2004); households need to make decisions on the current consumption expenditures and future consumption expenditures (the outflow of resources) based on both the current and future income (the inflow of resources), which together make up the budget constraint of over the life-cycle. Under the consumption smoothing assumption, households are entitled to increase financial assets for future consumption and debt for current expenditures.

The empirical findings of Modigliani and Cao (2004) support this hypothesis by finding the approximately synchronous movement of the aggregate saving rate and the growth rate of long-term income. The life cycle hypothesis is therefore supported at the aggregate level. Meng (2003) uses two

[7] The one-child policy, a nationwide policy enforced to control family size, plays a considerable role in shaping the demographic structure of the Chinese population.
[8] When the stable employment relationship was dismantled as required, the demographic structure was changed along with the removal of the protection network.
[9] The traditional Keynesian model demonstrates that current income is the only determinant in savings without any intertemporal arrangement (Friedman and Becker, 1957), different from the life cycle models dealing with intertemporal saving decisions subject to utility maximisation.

datasets, the 1999 Urban Household Income, Expenditure and Employment (UHIEE) and the 1995 Urban Household Income Distribution Survey (UHIDS), to empirically test the permanent income hypothesis. The results suggest that households smooth their total consumption and nondurable consumption through savings in different periods.

However, not all empirical results reconcile with this traditional model (Cristadoro and Marconi, 2012). Chamon and Prasad (2010) find that the youngest and oldest Chinese residents have comparatively higher saving rates among different age groups forming a U-shaped pattern and that the survey results show that the borrowing behaviours are not influenced by predicted future income growth, violating the assumption of consumption smoothing under the life cycle hypothesis. The traditional theory cannot explain the phenomenon that older people still keep enhancing their savings and increase their personal wealth after retirement. This phenomenon can be partially explained by the bequest motives (the tradition of the inter-generation wealth transformation). Strong bequest motives of Chinese people can partially explain why elderly residents do not reduce their savings and wealth after retirement and other phenomena that cannot be explained by traditional life cycle theories (Yin, 2012). Horioka and Wan (2007) present an inertia phenomenon with higher income growth and higher saving rates with provincial data, violating the permanent income assumption. Cristadoro and Marconi (2012) indicate that the relationship between income growth and household savings is opposite for urban and rural households. These empirical analyses provide mixed evidence of the traditional models, meaning that these traditional models are not enough to explain household financial behaviours.

At this analytical juncture, there is an important concern about the reasons why this chapter ultimately chooses the financial assets as the target (related to the ratio of financial assets to household income) rather than the household savings (related to the saving rate). From the data that this chapter uses, the main subcategories nested under the financial assets are bank deposits (fixed deposits and current deposits), commercial depository insurances, housing funds, stocks and bonds. Taking the urban respondent households as an example, the monetary amounts of bank deposits account for approximately 65% of the total monetary amount of financial assets owned by the urban households on

average in the year 2002, and the monetary amount of housing funds, commercial depository insurances, stocks and bonds approximately accounts for 13%, 3.5%, 6% and 1.7% respectively. Apart from stocks and bonds, the other three categories make up nearly 82% of total financial assets.

As for housing funds, the prominent Chinese Housing Provident Funds (HPF) program plays a vital role in the nationwide housing restructuring processes. This program became nationwide in 1995, aimed at providing funds for housing consumption or housing repairs, and the subsidised savings with higher interest rates, compared with risk-free bank deposits, in the HPF account, are allowed to be claimed and withdrawn at retirement by law (Chiquier and Lea, 2009; Chen and Deng, 2014). Theoretically, the housing provident funds and the commercial depository funds have identical functions with traditional savings deposited in banks; in other words, they can be regarded as alternative substitutes for bank savings. Especially in a society with undeveloped financial markets, savings and quasi-savings comprise the majority of household financial decisions. As discussed above, Chinese households may not smooth their consumption under the scenarios of income growth (Cristadoro and Marconi, 2012; Horioka and Wan, 2007). This implies that even with positive expectations about future income (income growth), there is still an inertia phenomenon of saving rates continuously increasing and consumption ratios continuously decreasing.

2.2.3 Determinants of household decisions

Furthermore, this chapter uses information about financial assets, debt, and consumption (durable, nondurable and total) at the household level. The study of Kukk (2017) shows that household debt is negatively associated with the holdings of household assets using the first wave of the Eurosystem Household Finance and Consumption Survey (EHFCS). There is a kind of interdependence relationship among the household decision processes on financial assets, financial debt and household consumption. For example, the decision to invest more in financial assets is likely to restrict the household's capacity to consume goods and services with a given household budget and unchanged household debt.

A strand of literature investigates the determinants of financial assets and debt at the household level. For instance, focusing on the households' financial decisions in Germany, the UK and the US, Brown and Taylor (2008) find the determinant role of household income position, household size, number of children and some demographic characteristics of the household head (i.e., education, age, gender, marital status, ethnicity, employment status and health status). The income position reveals whether each household is poor, median or rich by determining the income percentile each household falls into. Brown and Taylor (2008) find that households in lower income positions have lower financial assets and financial debt in Germany, the US and the UK after controlling other covariates. Using a similar strategy, Chichaibelu and Waibe (2018) investigate the household borrowing behaviours of two developing Asian countries, Thailand and Vietnam, concluding that poorer households are more likely to be over-indebted. Interestingly, Denizer *et al.* (2002) indicate that, among households in five income quintiles, households in higher income positions save more. Income position is a critical factor in determining households' financial decisions.

Furthermore, household size and composition provide essential information in determining financial decisions. Household size, the number of household members, is commonly seen in the existing literature studying household financial behaviours (Brown and Taylor, 2008; Brown *et al.*, 2013; Crook, 2001; Brown *et al.*, 2005). Crook (2001) finds that household size has a positive impact on household debt using the US survey data. The inclusion of household size reveals households' reaction to an additional household member. Specifically, some authors like Brown and Graf (2013) and Frijters *et al.* (2012) are interested in small households with one or two persons or big households with at least three household members, so they include dummy variables for the corresponding categories to capture the features of difference household type.

Household composition is another important variable in financial decisions. Lenton and Mosley (2005) employ random-effects regression models finding that the number of children is statistically significant in determining the probability of being indebted, the amount of debt, and the perceptive worrying

towards debt issues, using the panel data from the Families' and Children's Survey of the UK. Using the China Household Finance Survey, Lugauer *et al.* (2019) demonstrate that the number of children is negatively associated with household saving rates. The number of children reveals the household dependency burden on raising children.

Similar to the number of children, the number of adults (or the number of employed household members) and the number of household members with bad health are two aspects of household composition. Keese (2012) includes the number of children and adults in the random-effects panel regressions at the same time to isolate the impacts of children and adults, respectively, with both coefficients for the debt-to-income ratios being positive. The author provides an explanation for this result that an additional household member brings corresponding burdens on household budgets. In Rosen and Wu (2004), nationally representative panel data from the Health and Retirement Study of the US are exploited to study household financial behaviours finding that health conditions of household members determine the household portfolio choices (different types of financial assets, risky or not).

In addition to these variables reflecting households' income position and composition, the household head's characteristics (both socio-demographic and socio-economic) are also associated with household financial decisions (e.g., gender, age, marital status, ethnicity, schooling years). From the empirical results (e.g., Denizer *et al.*, 2002; Brown *et al.*, 2005; Brown and Taylor, 2008; Keese, 2012), the coefficients on the household head characteristics reflect different reactions of specific households. For example, in Brown and Taylor (2008), empirical results show that households with male heads are more likely to hold higher financial assets and lower financial debt in the UK and the US while having lower assets and debt in Germany. Chamon *et al.* (2013) simulate the changes in household savings towards different income shocks for multiple groups with households having heads of different ages, and results illustrate that the responses vary across different ages of household heads. The authors provide a rationale for the difference that households with younger heads have longer horizons to respond to the changes. Moreover, other characteristics of heads disclose more information to distinguish the impacts on different types of households.

2.2.4 Financial expectations

This chapter introduces expectation variables into the empirical investigation of household decision-making processes. The importance of expectation variables originates from their informative functions in future financial outcomes and their explanatory functions in current financial outcomes.[10] Generally, the expectation data are mainly obtained through surveys, i.e., questionnaire-based or interview-based, and the expectation variables are measured from the answers of pre-designed forward-looking subjective attitude-oriented questions. The scale-measured results can be used in corresponding decision-making research, revealing "agents' private information" (Acemoglu and Scott, 1994), which cannot be derived from factual information. Expectation variables provide practical ways for researchers to capture psychological characteristics most relevant to specific future status (i.e., financial status) and future life events (i.e., employment).

Generally, decision agents have better information than researchers since subjective information is unobservable. The deficiency of expectation variables may lead to inefficient and ineffective results. Acemoglu and Scott (1994) indicate that the behaviours of decision-makers are forward-looking; this is why consumer expectations have predictive power in consumption as confidence indicators. According to the empirical analysis of the authors, there is a positive statistical connection between financial expectations and consumption, but the statistical variances (i.e., forecast errors) vary across different levels of optimism or pessimism among individuals.

Thus, looking at the decision processes combining fundamentals and expectation variables is meaningful. For example, individuals, households, and governments invest lots of financial and social resources in education with ambitious expectations of better wages and social status (Schoon, 2010). In general, higher expectations, personal or parental, on education drive people to pursue higher education

[10] There are many other types of expectation variables in both the psychological and the economic fields; however, the expectation variables in this chapter mainly refer to consumer expectations and income expectations.

outcomes, but equally ambitions people from different social stratifications, ethnic backgrounds, communities, etc., still show huge differences (Raffo *et al.*, 2007; Attanasio and Kaufmann, 2009). Human decision-making is more complex than we thought. Fundamentals provide realised observable information, while expectations provide complementary subjective private information of individuals.

The commonly used expectations can be roughly divided into two categories: probabilistic expectations and point expectations, each with advantages and limitations. The Dominitz-Manski methods in Dominitz and Manski (1997) and Dominitz and Manski (1996) are widely used in introducing the survey experiments of eliciting probabilistic expectations for American household members. The former elicited probabilistic income expectations through telephone surveys requiring respondents to answer the corresponding likelihood of achieving each household income threshold in one year. After collecting a sequence of numerical probabilities, researchers can use mathematical techniques to construct the distribution of expected future household income. Such methods of eliciting probabilistic expectations endow expectations with high comparability (van Santen *et al.*, 2012; Manski, 2004) and high expansibility due to their numerical essence and mathematical consistency.

The latter work of Dominitz and Manski (1996) introduced a new interview survey method based on interactive computer-based techniques to obtain the distribution of expected future earnings over education. With the advancement of data sciences and computer sciences, the methods of collecting expectation data are manifold. For the Dominitz-Manski experiment, the researchers asked the experiment participants to answer the percentage chance of achieving different threshold earning levels for various scenarios with different specified schooling years. With the surveyed probabilities, the subjective expectation distribution can be elicited. There is no denying that the probabilistic expectations have high scalability for different demands – getting the probabilities of achieving different incomes and obtaining the probabilistic distribution over different income levels. However, when collecting data in developing countries, it is not justifiable to presume that all respondents would be capable of responding to every question enumerated in the questionnaires, particularly those pertaining to probability.

Nevertheless, point expectations are associated with exact anticipated numbers for survey questions. Relevant to the Dominitz-Manski returns-to-schooling surveys, some other researchers focus on point income expectations on future education attainments, which are expected future earnings after attaining specified education levels (Attanasio and Kaufmann, 2009; Smith and Powell, 1990). Concerning financial income expectations, point expectations are more valuable for short-term forecasts when respondents are willing and able to predict their future income with low uncertainty and high accuracy (Marcel and van Soest, 1997; Lusardi, 1997). The difficulty and variation of processing information in eliciting point expectations are much lower than that of assessing and dealing with information used in forming subjective probabilities of events in many aspects like the amount of information, the difficulties in aggregating information, and the accuracy of available information (Hurd, 2009).

Manski (2004) demonstrates that expectations in the probabilistic form are superior to verbal expectations using simple qualifiers or discrete options for several reasons. There are well-defined survey measuring scales for all respondents to elicit expectations probabilistically without causing ambiguity. This irreplaceable trait stems from its numerical nature and depends on respondents' perceptions and interpretations of each survey question. Using numerical probabilities to deliver personal beliefs is more complex than we thought since the accuracy and credibility of probabilistic results are partially determined by individuals' traits like willingness and capacity. Delavande *et al.* (2011) indicate that one possible reason for the lack of subjective expectation data in developing countries is that it wastes time, effort, and resources when individuals, especially less-educated citizens, are not able to understand specific expectation-related concepts. Considering this fact, in developing countries, attitudinal investigators usually conduct on-the-spot face-to-face interviews or investigations to provide assistance where necessary, especially when the surveys are on a national scale.

Both types of expectation variables, probabilistic and non-probabilistic, are popular in developed countries like the US and the UK; however, based on reality, it is more common for developing countries to elicit subjective expectations in non-probabilistic forms, with a Likert scale or an exact

number, like the Chinese Household Income Project and the Mexican Family Life Survey. There is a list of Likert-type options (e.g., increase, unchanged, decrease for income changes) or a blank to be completed with exact numbers (e.g., the expected earnings under hypothetical scenarios).

There are two essential concerns in eliciting Likert-type expectations, the group-sensitive biases and the ambiguity essence. The group-sensitive biases include the acquiescence/extreme response tendency, especially in agree-disagree questions (see Kuru and Pasek, 2016 and Harzing, 2006 for examples) and the neutral response pattern (see Brown *et al.*, 2023 for financial expectation examples). As long as the two types of biases are detected and identified, adjustment is required to avoid getting misleading results. As for the ambiguity, some Likert-type options are ambiguous by nature; for example, McFadden *et al.* (2005) illustrate that when respondents are provided with a Likert scale from excellent to poor for assessing their health status, it is meaningless to make comparisons among different groups without standardising the measures. Thus, individual comparisons are difficult due to the discordance of personal judgement standards.

One solution to improve interpersonal comparability is to involve the "anchoring vignettes" (Alexander and Becker, 1978; McFadden *et al.*, 2005; Delavande *et al.*, 2011), which provide an implicit and effective anchor for respondents to follow as criteria across all individuals to standardise the subjective questions. For example, the dataset this chapter uses has the health status question in the questionnaires where investigators ask the individuals to assess their health conditions using the cohort with the same age as the reference group and provide a five-point Likert-type scale (from "Very good" to "Very bad"). Such question design gives all respondents an anchoring vignette; that is a kind of insinuation or suggestion that people can compare personal health conditions to people of the same age rather than the whole population or other alternative groups.

Another example in the survey questionnaires is the income position question. This question is intended to collect information on respondents' perception of their household living standard in the city or village they live in, compared with other households in the same administrative region. The attitudinal

researchers set four options for the respondents: the highest income quartile, the second highest income quartile, the second lowest income quartile and the lowest income quartile. Respondents can choose any subgroup based on their subjective attitudinal judgements compared to other citizens. In some cases, Likert responses can act as a good substitute for subjective probabilities (Delavande *et al.*, 2011). In the surveys this chapter uses, questionnaire designers focus on using the solution to enhance the comparison across groups and regions.

Income expectations compensate for the deficiency of past research because they provide implicit information that drives the decision-making of individuals and households. Income expectations are one non-negligible determinant of making financial decisions since financial decisions have strong connections with the current and future dimensions, where the future is uncertain. This is why expectation variables (the future side) and other static fundamentals (the current side) should be analysed separately. To deal with the uncertainty in the decision processes, the income expectations of individuals and households are critical in modelling financial decisions.

Generally, two methods have been employed to generate income expectations. The first is using observed realisation data to format income expectations based on the available information set and hypothetical information processing approaches that models assume (Dominitz, 2001). The results might be biased since the researchers cannot get the complete information that individuals use to derive income expectations, even with strong assumptions. The second is collecting the subjective income expectations directly, probabilistic (see Manski, 2004 for the US and Delavande, 2014 for developing countries) and non-probabilistic income expectations. The emergence of subjective income expectations releases the strict assumption of rational expectations (van Santen *et al.*, 2012; Manski, 2004; Kaufmann and Pistaferri, 2009). When direct income expectations are available, there is no need to hypothesise how people formulate their expectations of future income since respondents provide their subjective expectations in a direct way of answering subjective questions. Moreover, with income expectations, even without rich income realisation data, researchers can still estimate consumption and saving models using cross-sectional data or panel data.

Consistent with many financial expectation papers, income expectations are regarded as consumption goods when we conceive financial expectations to predict future income levels (Gao and Smyth, 2011; Caner, 2015; Frijters *et al.*, 2012). After receiving the research variables as consumption goods, the income expectation variables can be embedded into the utility functions with other influencing factors. Here, self-reported income expectations, with both psychological and economic settings, can be treated symmetrically with current income and permanent income.

This assumption in the economic field regarding expectations as a consumption good is consistent with the findings in both the psychological field (Cannon, 1914; Horwitz *et al.*, 2017; Rief and Joormann, 2019; Kube *et al.*, 2019) and the neuroscience literature (Berns *et al.*, 2006; Seth *et al.*, 2012); positive expectations have positive impacts, and negative expectations have negative impacts directly on individuals. Horwitz *et al.* (2017) and Rief and Joormann (2019) indicate that negative expectations have significant predictive power on negative emotions (like depression), ideation, and behaviours (like suicides) and emphasize the importance of monitoring and intervention to enhance advantageous expectations. In the current neuroscience research, in contrast with traditional neurocognitive mechanisms, the nervous system has predictive-coding mechanisms with specific brain areas dealing with expectations (Seth *et al.*, 2012). Perceptual expectations are the processing of results in the brain towards different stimuli as informative signals, bringing people corresponding psychic outcomes (Summerfield *et al.*, 2008) and determining individuals' behaviours afterwards. Following this assumption, financial expectations have their value in the context of economics.

Financial expectations are the anticipatory perception of future financial status; in this research, financial expectations reveal the subjective judgement of the respondents' future household incomes. The income expectations are formed psychologically after being aware of the trend and uncertainty in the future; afterwards, the anticipatory income tendency influences the decision basis of household members' behaviours. Brown and Taylor (2006) find the intertemporal inertia phenomenon of income expectations using the British Household Panel Survey (BHPS); that is, financially optimistic

individuals are prone to be optimistic in the next period, showing the persistence of subjective financial expectations. That is that the current expectation results contain the information from previous expectations. The inertia phenomenon of income expectations imparted by previous expectations is thought to partially represent the persistence of other variables, like inflation and output, at the macroeconomic level (Fuhrer, 2017) due to the intrinsic imperfect expectation formation mechanism with slow and incomplete processing of new information "excess smoothness" (Fuhrer, 2018). Little literature to date studies the association between expectation inertia and household financial decisions.

In the 1990s, scholars began to model forward-looking income growth and uncertainty (see e.g. Carroll and Weil, 1994; Kraay, 2000). As they mentioned, there are at least two influential paths of income expectations on financial outcomes, especially savings and consumption. The first possible pathway is that, given expected future household income uncertainty, higher income expectations were associated with higher household consumption ("consumption smoothing") and lower household savings after the relaxation of financial constraints. Meanwhile, the second proposed functioning pathway of income expectations is that, given the expected magnitude of income changes, expected higher uncertainties are the obstruction of raising present household consumption, accompanied by higher precautious savings. Details will be discussed in the following two sections. There is no doubt that the perception of future conditions matters, and subjective financial expectations influence financial decisions made by economic agents.

Before the income expectation variables were available in the related field, proxies or instruments were the common practice to study the impacts of expected income status. The quality and efficiency of proxy variables determine the credibility of research in this field. Especially at the initial stage of development, the difficulties in statistical measurements were ubiquitous in developing countries. To analyse the role of income expectations, this chapter uses this data source collected through questionnaire-based face-to-face interviews. The usage of survey data provides a new perspective on the household level and overcomes the measurement barriers to some extent since the respondents directly give the data. Using the CHIP, it is possible to distinguish between assets and financial assets

and between current/consumption expenditures and capital expenditures. These variables are constructed by designing related questions as demanded and collected by the investigators.

Household assets and household debt reflect the intertemporal arrangements of household financial resources. Evidence shows that models with expectation variables have higher predictive power than the traditional models exclusively containing fundamental economic variables (Kłopocka, 2017). Expectation variables, such as subjective indicators, contain characteristic information that other economic fundamentals do not have. This feature makes financial expectations more valuable in predicting future financial behaviours and explaining current household decisions. Self-reported expectant variables can effectively reduce the requirements of setting model-related assumptions because the expectation variables are the direct measures of respondents' attitudes toward future events and conditions. This helps attitudinal researchers unravel or bypass a Gordian knot, a metaphor for the pivotal and intractable problem of how people use and process available information to derive subjective expectations.

From the perspective of behavioural economists, the assumption of irrationality is more reasonable than the rational assumption. Kaufmann and Pistaferri (2009) use Italian data to verify that income expectations effectively separate the anticipated income changes from the unanticipated components. Using subjective income expectations eliminates the need for researchers to make many arbitrary assumptions for estimating consumption models, like the Euler intertemporal consumption models (Giamboni *et al.*, 2013; Kapteyn *et al.*, 2009). Irrational optimism and pessimism naturally result in irrational deviations with anomalies in household behaviours like excess sensitivity of consumption (Jappelli and Pistaferri, 2000). Giamboni *et al.* (2013) find that the predictable deviation of realized household income from the mean value of expected household income can be used to explain the consumption anomalies, thus protruding the importance of irrational expectations, using the Netherlands household data. Ignoring the role in household financial decisions may, at least, lead the models to specification biases.

Many empirical findings support the negative relationship between irrational optimism and savings (Brown and Taylor, 2006; Arent, 2012), even if it is not always the case.[11] Savings perform the function of smoothing financial resources intertemporally. The permanency of income uncertainties is the core of understanding the role of income expectations in explaining savings behaviours. Except for income expectations, other approaches have been used to model income uncertainty, like the income variations (both the transitory income variation and the permanent income variation due to income shocks) as the proxy (Chamon *et al.*, 2013). The limitation of using income variation as the proxy of income uncertainty is the requirement for rich data over multiple years. In contrast, subjective expectation information allows researchers to study household financial behaviours only using cross-sectional data.

Income shocks and income uncertainties influence household saving decisions (Chamon *et al.*, 2013); however, how people perceive the income changes, rather than the "calculated" ones, matters in the decision-making processes (Dominitz and Manski, 1997). Fulford (2015) finds that less than 3% of the US households, who chose precautionary motives as the main reason for saving, chose possible future unemployment as the reason for precautionary savings, and the overwhelming majority selected unexpected demands of financial liquidity as the reason to build liquid assets. This statistical finding supports the cognition that the researchers should not neglect the attitudinal perception of the study objects. Even if there are straightforward methods to judge the household income trend using the realisation data to fit many models designed to forecast future income changes, corresponding subjective variables are still important (Dominitz and Manski, 1997).

According to the income expectations, under the irrationality assumption, the respondents can be divided into three groups: financially-optimistic, neutral and financially-pessimistic. Brown *et al.* (2005) theoretically illustrate that anticipative optimism about future financial status induces individuals and households to hold more unsecured debt using multiple waves of the British Household Panel Survey (BHPS). Much behavioural and economic research also studies the explanatory and predictable power

[11] The relationship is inverse for Western Germany and Eastern Germany (Arent, 2012).

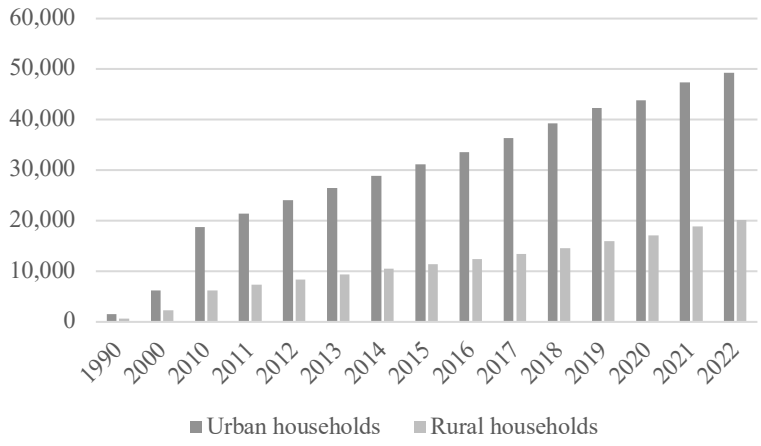
of financial expectations on consumption decisions and consumption variation (Giamboni *et al.*, 2012; Brown and Taylor, 2006). Kapteyn *et al.* (2009) use Dutch panel data to demonstrate that subjective income expectations have explanatory power in predicting household consumption. Browning *et al.* (2016) and Brown *et al.* (2023) find that financial expectations influence the likelihood of consumption (total and categorical) and the amount of consumption as well.

2.3 Institutional Background and Data

2.3.1 Institutional background

There is a unique administrative household hukou system in China, within which all households can be divided into two types – urban and rural households. The purpose of establishing this registration system is to control interregional mobility and facilitate carrying out asynchronous policies in different areas throughout the country. Cheng and Selden (1994) conclude that the state directly distributes resources to urban residents while rural residents rely on local communities and collective groups, and priorities are given to the urban areas rather than the rural ones. The special political arrangements of the urban-rural dichotomy result in two differentiated hierarchies within China. The discrepancies between the urban and the rural embody almost every socioeconomic aspect, such as after-retirement pension systems, education, economic development, etc.

Figure 2.3 Annual per capita disposable income in China (urban and rural, in RMB yuan)



Source: National Bureau of Statistics of China (National Bureau of Statistics of China, 2023)

Due to the priorities and privileges given to the urban districts and their citizens, the economic conditions of Chinese cities and towns are better than those of Chinese villages. The annual per capita disposable income of urban households is much higher than that of rural families, and the gap gradually keeps growing (Figure 2.3). Cristadoro and Marconi (2012) find that before 2000 the rural household saving rates were universally higher, but this result changed due to precautionary motives and backward financial systems after the reforms in pensions, education, housing, etc. They conclude that the saving behaviours of urban and rural households differ.

Faced with vast imbalances and inequities, many rural migrants with the rural hukou started to find jobs in towns and cities in the 1990s. Even if they are employed in the urban areas, they are not entitled to receive the benefits (e.g., pension supports based on the hukou location) and the services (i.e., subsidised medical services) that urban workers with urban hukou have access to (Seeborg *et al.*, 2000). Limited to the hukou management system, rural-to-urban migrant workers have to save more than urban workers, even if they work in the same district. The number of migrant workers in 2002 was about 80 million and increased to more than 150 million in 2010, which cannot be neglected in the study. In this study, the urban, rural, and migrant households are analysed separately due to the existence of the hukou system, considering their unique characteristics.

2.3.2 Data

This chapter exploits data from the 2002 wave of the Chinese Household Income Project (CHIP 2002), collected by conducting interviews based on pre-designed questionnaires for the three categories: urban, rural and migrant households.[12] This division stems from the limited mobility across regions due to pension portability issues and labour migration restrictions (Guo and N'Diaye, 2011). Both the household-level and the individual-level information are used in this study; the individual answers are used to compose the characteristics of their families, i.e., the number of household members employed. Besides, the urban household income is not available in the urban questionnaire, but it can be derived by summing the income of each member of the household. The competitive advantage of the CHIP 2002 is that this dataset contains attitudinal information on income expectations.

According to the introduction by Shi *et al.* (2008), a stratified systematic random sampling scheme with two stages is used to choose the target cities and county towns (or villages) in the first stage and the respondent households of the selected administrative regions in the second stage. Before implementing this statistical method, the provincial target areas were manually determined before the investigation according to the research demands. The urban part investigated ten representative provinces and two

[12] Two primary factors underpin the utilisation of cross-sectional data. Firstly, the 2002 wave exclusively provides insight into household income expectations, which is an essential drive for the adoption of cross-sectional data for this analysis. Secondly, the participating institutions responsible for data collection exhibit variation across different waves of the CHIP datasets, leading to disparities in many aspects, such as the samples and the survey questions. For example, migrant samples are not included in all waves. Further information can be found on the official website: https://ciidbnu.org/chip/.

municipalities (Beijing and Chongqing, directly under the management of the central government). At the same time, the rural survey was conducted in 22 provincial administrative areas, purposely including two autonomous regions (the Guangxi province and the Xinjiang province) and two municipalities (Beijing and Chongqing).[13] They were chosen from different geographical regions of China, the coastal (eastern), central (middle), and western areas. This tri-regional disparity is closely associated with the significant and distinct imbalance of the regional economic development, with the coastal region relatively developed and the western region economically disadvantaged. The ethnic, geographical and developmental issues were considered in the selection process of the survey.

Then, for the urban part, the cities, apart from the two municipalities, were stratified into five types according to their population size (very large, large, medium, small, and town-size). Each city of each category was further divided into six regions geographically (the Northeast region, the North, the East, the Centre, the Northwest and the Southwest).[14] For the rural sample, compared with the household sampling processes of the urban area, the procedures in the rural sampling were more straightforward since the villages were chosen directly and randomly without considering the population size.

[13] Shi *et al.* (2008) emphasize that the purpose of adding these two first-level administrative autonomous regions in the 2002 wave is to prepare the research data for the scholars interested in investigating and studying the ethnic minority issues in China. The main feature of the autonomous regions at the provincial level is the population size of the minority ethnic citizens.

[14] The method of selecting the investigated cities or villages shows the division of surveys (i.e., urban, rural and migrant households) is based on the geographical characteristics rather than the type of hukou of the residents, a unique identity management system used to identify the cognitive belonging. The hukou system is primarily designed to restrict inter-province migration, but not urban-to-rural or rural-to-urban migration. For example, an individual with a rural hukou can be a part of the respondents in the urban survey.

Afterwards, the object households are randomly selected from these groups.[15] Unlike the urban survey, the households involved in the migrant survey were selected from the resident communities of big cities.[16] Migrant households are defined as the households with a rural hukou and have been living in the urban resident communities for more than six months (Qu and Zhao, 2017). Due to their rural hukou, migrant households face discrimination in urban areas, forming a distinct group within resident communities (Chen *et al.*, 2015).[17]

2.3.3 Dependent variables

The dependent variables considered in this chapter are the ratios of household financial assets, household debt, and household consumption (total, durable, and nondurable) with respect to total annual household income. That is, the dependent variables contain the asset-to-income ratios, the debt-to-income ratios, and the consumption-to-income ratios for total consumption, durable consumption, and nondurable consumption. For the models fitted for urban and migrant residents, the ratios of durable

[15] One of the authors of Li *et al.* (2008) is the principal investigator of the CHIP 2002 dataset. Further credible information about sampling methods and features of the survey can be found in this book section. See http://www.ciidbnu.org/chip/index.asp for more description on the CHIP datasets.

[16] Usually, the migrant samples are difficult to be drawn randomly from the target cities for Chinese migrant families, especially those who are not recorded in the resident communities, like those working in the manufacturing section without fixed living places (Khan and Riskin, 2005; Démurger *et al.*, 2009). Thus, selection biases are inevitable to some extent due to information collection barriers.

[17] Due to the restrictions imposed on migrant households, they are placed at a disadvantage in terms of job opportunities, working conditions, wages, and social benefits (Qu and Zhao, 2017; Knight and Yueh, 2009). Generally, lower income, worse working conditions, and delayed payment are regarded as common features for migrant households (Démurger *et al.*, 2009). See Chen *et al.* (2015) for detailed description.

and nondurable expenditures to total household income are used. These data are not available for rural residents due to the unavailability of corresponding data regarding consumption categories.

The asset-to-income ratio is one of the proxies to measure financial buffers at the household level (Brown and Taylor, 2008; Cox *et al.*, 2002); correspondingly, the debt-to-income ratio reflects the financial fragility or the financial burden of indebted families. Different from these two indicators indicating the household financial conditions, the expenditure-to-income ratios summarize the household affordability of consumptive goods and services, providing a revealing insight into the marginal propensity to consume. This ratio represents the fraction of income used to meet the consumptive demands of individuals and households.

Table 2.1 The distribution of the assets-to-income ratios and the debt-to-income ratios (urban)

Variable	Target group	Percentiles				
		10th	25th	50th	75th	90th
The ratios of household financial assets to annual household income (the asset-to-income ratios)	All households	0.115	0.420	1.053	2.020	3.432
	Total household income 0-25th percentile	0.000	0.212	0.737	1.860	3.809
	Total household income 25-50th percentile	0.118	0.385	0.998	1.983	3.317
	Total household income 50-75th percentile	0.203	0.496	1.109	2.000	3.304
	Total household income 75th percentile or above	0.294	0.644	1.281	2.166	3.401
The ratios of total household debt to annual household income (the debt-to-income ratios)	All households	0.000	0.000	0.000	0.000	0.495
	Total household income 0-25th percentile	0.000	0.000	0.000	0.000	0.868
	Total household income 25-50th percentile	0.000	0.000	0.000	0.000	0.320
	Total household income 50-75th percentile	0.000	0.000	0.000	0.000	0.416
	Total household income 75th percentile or above	0.000	0.000	0.000	0.000	0.322

Source: CHIP 2002 and the calculation of the author

Table 2.2 The distribution of the assets-to-income ratios and the debt-to-income ratios (rural)

Variable	Target group	Percentiles				
		10th	25th	50th	75th	90th
The ratios of household financial assets to annual household income (the asset-to-income ratios)	All households	0.024	0.121	0.398	0.903	1.680
	Total household income 0-25th percentile	0.030	0.120	0.367	0.989	2.086
	Total household income 25-50th percentile	0.036	0.119	0.369	0.815	1.481
	Total household income 50-75th percentile	0.034	0.146	0.441	0.868	1.602
	Total household income 75th percentile or above	0.000	0.100	0.418	0.975	1.659
The ratios of total household debt to annual household income (the debt-to-income ratios)	All households	0.000	0.000	0.000	0.000	0.419
	Total household income 0-25th percentile	0.000	0.000	0.000	0.091	0.882
	Total household income 25-50th percentile	0.000	0.000	0.000	0.000	0.399
	Total household income 50-75th percentile	0.000	0.000	0.000	0.000	0.319
	Total household income 75th percentile or above	0.000	0.000	0.000	0.000	0.220

Source: CHIP 2002 and the calculation of the author

Table 2.3 The distribution of the assets-to-income ratios and the debt-to-income ratios (migrant)

Variable	Target group	Percentiles				
		10th	25th	50th	75th	90th
The ratios of household financial assets to annual household income (the asset-to-income ratios)	All households	0.000	0.125	0.417	1.033	2.083
	Total household income 0-25th percentile	0.000	0.027	0.195	0.672	1.500
	Total household income 25-50th percentile	0.000	0.110	0.357	0.862	1.833
	Total household income 50-75th percentile	0.056	0.179	0.467	1.101	1.780
	Total household income 75th percentile or above	0.125	0.347	0.777	1.583	3.053
The ratios of total household debt to annual household income (the debt-to-income ratios)	All households	0.000	0.000	0.000	0.000	0.313
	Total household income 0-25th percentile	0.000	0.000	0.000	0.000	0.595
	Total household income 25-50th percentile	0.000	0.000	0.000	0.000	0.273
	Total household income 50-75th percentile	0.000	0.000	0.000	0.000	0.217
	Total household income 75th percentile or above	0.000	0.000	0.000	0.000	0.125

Source: CHIP 2002 and the calculation of the author

Table 2.1, Table 2.2 and Table 2.3 summarize the distribution of the asset-to-income ratios and the debt-to-income ratios by the household income levels for the urban, the rural, and the migrant residents, respectively. Each table has two main parts. The part above shows the percentiles of the asset-to-income ratios for different groups. The part below shows the percentiles of the debt-to-income ratios for different groups. For the urban households, compared with the other two subgroups, a significant difference is that more than half of the households hold financial assets with a monetary value higher than the total household income of that year (see the third row of Table 2.1).

Importantly, for the top decile of the urban households in each income level, the asset-to-income ratio is greater than 3.3, approximately three times that of the median households. By contrast, for more than 75% of the rural households, the asset-to-income ratios are less than one, with the amounts of financial assets the households possess smaller than the total annual household income (see the sixth column of Table 2.2). Urban households tend to maintain higher asset-to-income ratios than rural and migrant households. The disaggregated measures across heterogenous income quartile groups demonstrate that, among the four income groups, those with household income in the highest quartile have higher asset-to-income ratios in specific percentiles.

Generally, the asset-to-income ratio is an indicator widely used to represent the household liquidity constraint (Zeldes, 1989). From a broader functional perspective, the ratios of financial assets to household income potentially reveal the household resilience capacities (the financial buffer function) towards transitory and permanent shocks. With the household income level held constant, the asset-to-

income ratios increase when households hold more financial assets. Therefore, higher asset-to-income ratios indicate whether households have enough financial resources to meet the demands, i.e., servicing the ongoing debt and paying medical expenses.

Another method to signal household "financial health" is the debt-to-income ratios (Cox *et al.*, 2002), exhibiting the relative household financial burden. From the statistics derived from the CHIP 2002, 85.11% of urban households, 77.98% of rural households, and 84.50% of migrant households do not have any debt. Even for indebted households, the financial burden is not heavy from the distribution of the debt-to-income ratios. In particular, the ratios of household debt to total annual household income are less than 0.5 for all observations in the 90th percentile, with 0.495 in Table 2.1, 0.419 in Table 2.2, and 0.313 in Table 2.3.

Turning to the consumption-to-income ratios, based on traditional models of consumption smoothing, the consumption-to-income ratios and income levels change in the opposite direction if consumption is smoothed in reaction to permanent and temporary shocks (Sabelhaus and Groen, 2000). However, Acemoglu and Scott (1994) mention that the liquidity and borrowing constraints in the imperfect financial market are most relevant to durable and nondurable expenditures, respectively. With more barriers to borrowing, consumption smoothing is more difficult to realise for the agents, even when the agents are optimistic about future income. Thus, studying durable and nondurable expenditure consumption is meaningful in looking at the explanatory power of income expectations on different consumption categories. The datasets this chapter uses provide different expenditure categories for

respondent households, which can be used to calculate the amounts of expenditures on durables and nondurables.

Table 2.4 provides the percentiles of the consumption-to-income ratios (total, durable and nondurable). The ratios of total consumption to annual household income for urban households and rural households at the 75th percentile are close to the unity, meaning that the consumptive expenditures are nearly equal to the total household income (see the third and sixth rows of Table 2.4). By comparison, at the 75th percentile, the nondurable-to-income ratio for migrant households is approximately 0.9, which is less than 1 (see the ninth row of Table 2.4). Lacking relevant data for rural households, it is reasonable to conclude that, at least from the distribution of the consumption-to-income ratios for urban and migrant households, the consumption patterns are different for the three sub-samples.

Table 2.4 The distribution of the consumption-to-income ratios (total, durable and nondurable)

Sub-sample	Variable	Percentiles				
		10^{th}	25^{th}	50^{th}	75^{th}	90^{th}
Urban	The ratio of total consumption to annual household income	0.449	0.592	0.769	0.964	1.236
	The ratio of durable expenditures to annual household income	0.371	0.496	0.652	0.820	1.027
	The ratio of nondurable expenditures to annual household income	0.038	0.059	0.092	0.145	0.233
Rural	The ratio of total consumption to annual household income	0.365	0.512	0.723	0.980	1.361
	The ratio of durable expenditures to annual household income	Not applicable due to the unavailability of data.				
	The ratio of nondurable expenditures to annual household income					
Migrant	The ratio of total consumption to annual household income	0.422	0.566	0.733	0.897	1.165
	The ratio of durable expenditures to annual household income	0.175	0.277	0.397	0.553	0.759
	The ratio of nondurable expenditures to annual household income	0.148	0.217	0.300	0.400	0.558

Table 2.5 Summary statistics of the dependent variables

Sample	Variable	Mean	Std. Dev.	Min.	Max.	No. of observations
Urban	The asset-to-income ratio	1.657	4.128	0.000	235.897	6,812
	The debt-to-income ratio	0.248	1.494	0.000	92.601	6,812
	The consumption-to-income ratio (total)	0.849	0.571	0.061	21.447	6,812
	The consumption-to-income ratio (durable)	0.709	0.441	0.055	12.103	6,812
	The consumption-to-income ratio (nondurable)	0.140	0.240	0.000	9.344	6,812
Rural	The asset-to-income ratio	0.768	2.151	0.000	111.707	9,194
	The debt-to-income ratio	0.197	1.101	0.000	46.575	9,194
	The consumption-to-income ratio (total)	0.917	2.121	0.058	151.825	9,194
	The consumption-to-income ratio (durable)	Not applicable due to the availability of data.				
	The consumption-to-income ratio (nondurable)					
Migrant	The asset-to-income ratio	0.941	2.215	0.000	50.000	1,999
	The debt-to-income ratio	0.182	1.056	0.000	26.923	1,999
	The consumption-to-income ratio (total)	0.880	1.016	0.000	18.017	1,999
	The consumption-to-income ratio (durable)	0.514	0.673	0.000	10.046	1,999
	The consumption-to-income ratio (nondurable)	0.366	0.446	0.000	8.657	1,999

Therefore, these five ratios (the asset-to-income ratio, the debt-to-income ratio and the three consumption-to-income ratios) are used to analyse the decision behaviours of Chinese households – the desired levels of financial assets, debt and expenditures (durable and nondurable) given certain household income levels. Summary statistics of these dependent variables are displayed in Table 2.5. The three subsamples (urban, rural, and migrant) from the CHIP 2002 comprise 6,812, 9,194 and 1,999

households, respectively. The empirical analysis contains all households without any missing value for the dependent and independent variables of interest.

As shown in Table 2.5, the average values of each variable for different groups (urban, rural, and migrant) are shown in the third column. The average asset-to-income ratios are 1.657 for urban households, 0.849 for rural households, and 0.941 for migrant households. The average debt-to-income ratios are 0.248 for urban households, 0.197 for rural households, and 0.182 for migrant households. The average consumption-to-income ratios regarding total expenditure are 0.849 for urban households, 0.917 for rural households, and 0.880 for migrant households. Thus, urban households have the highest average asset-to-income ratio and debt-to-income ratio. In contrast, rural households have the highest average consumption-to-income ratios regarding total expenditure.

From the fifth column of Table 2.5 displaying the minimum values of each variable for different groups (urban, rural, and migrant), the minimum values of all other consumption-to-income ratios are equal to zero, except for the consumption-to-income ratios of total consumption and durable consumption for urban households and the consumption-to-income ratio of total consumption for rural households. From the last column of Table 2.5 showing the number of observations of each variable for different groups (urban, rural, and migrant), there are 6,812 urban households, 9,194 rural households, and 1,999 migrant households.

Figure 2.4 Histograms of household financial assets, debt and expenditures (urban)

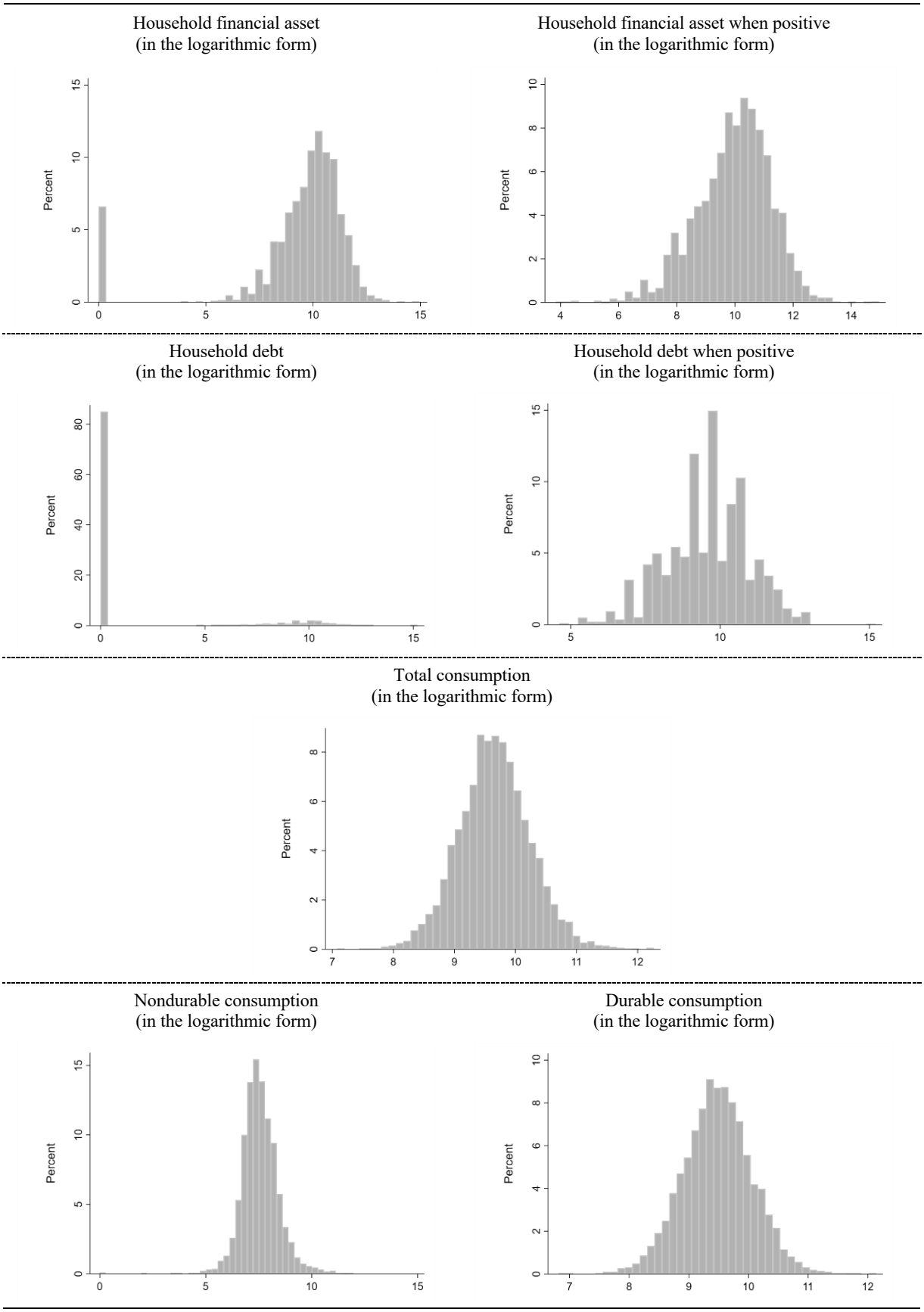
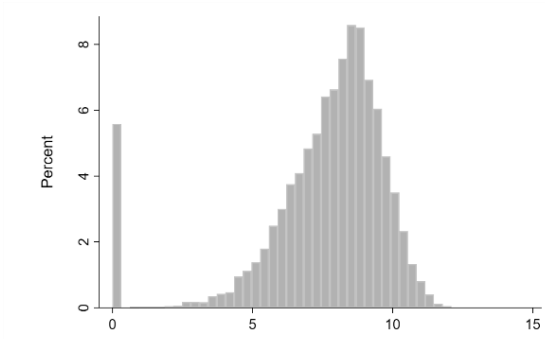
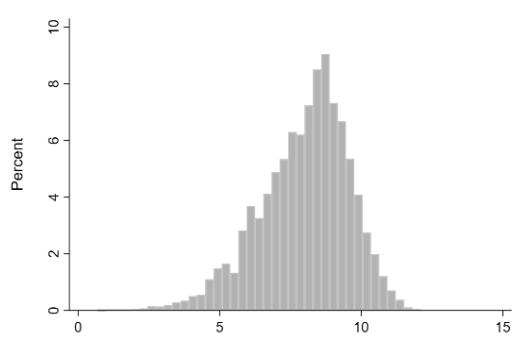


Figure 2.5 Histograms of household financial assets, debt and expenditures (rural)

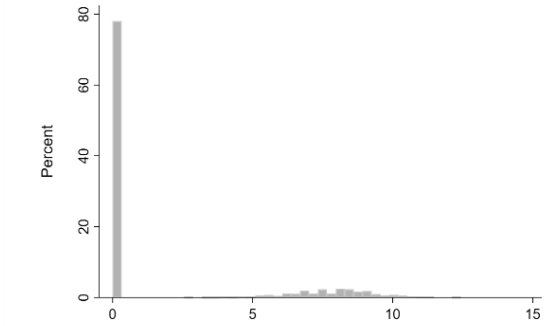
Household financial asset
(in the logarithmic form)



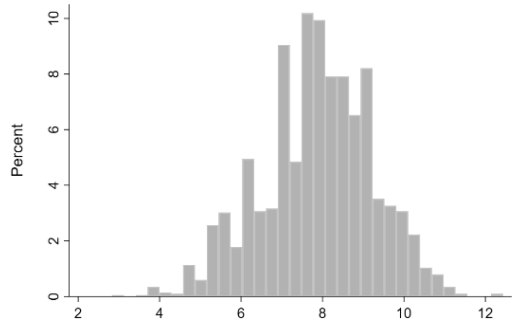
Household financial asset when positive
(in the logarithmic form)



Household debt
(in the logarithmic form)



Household debt when positive
(in the logarithmic form)



Total consumption
(in the logarithmic form)

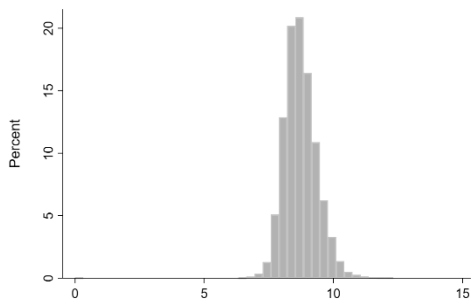


Figure 2.6 Histograms of household financial assets, debt and expenditures (migrant)

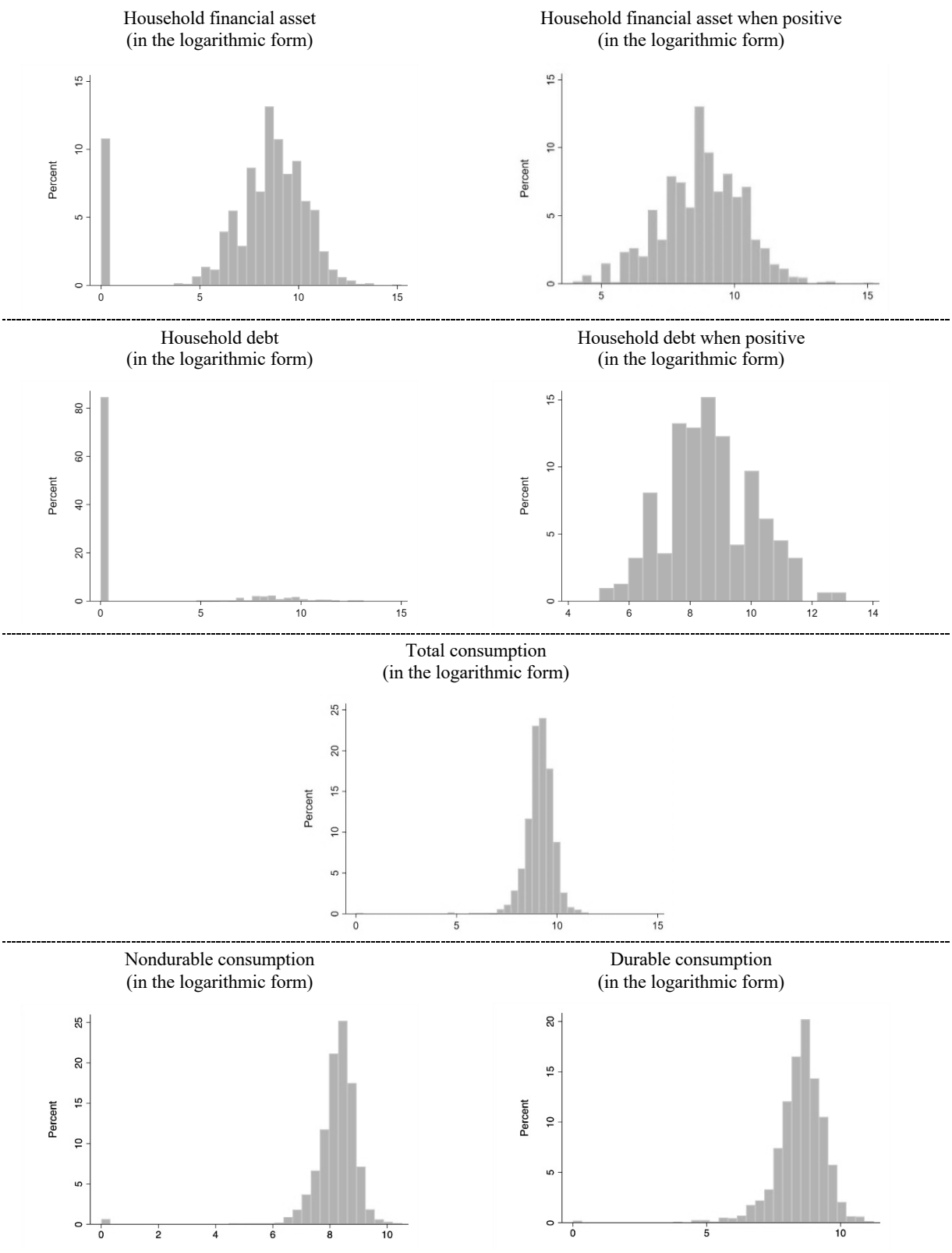


Figure 2.4, Figure 2.5 and Figure 2.6 present the histogram distributions of the natural log of the household financial assets, the natural log of the household debt and the natural log of the household consumption for each subsample. It is apparent that the asset and debt variables are censored at zero, meaning that corresponding households do not possess any financial asset or debt. Thus, the number of households with zero asset-to-income ratios is 449 (6.58%) for the urban, 513 (5.58%) for the rural, and 216 (10.80%) for the migrant, given positive total household income. The figures for the non-indebted households are 5808 (85.11%), 7174 (77.98%) and 1690 (84.50%), respectively.

2.3.4 Independent variables

The main independent variable is the expectations about future households' income for the next five years. For the financial expectations, the respondents were asked how they expected their household income to change in 5 years (from 2003 to 2007).[18] They had four options: a big increase, a small increase, no change, and a decrease. The four qualifiers measure the income changes in future household income. Respondents chose the qualifier describing the most likely scenario[19]. The income expectations derived in this survey do not belong to probabilistic expectations because the respondents are not required to provide any probability or percentage chance (and some respondents are unaware that they

[18] China's five-year plans feature economic growth targets and detailed objectives, and many sectors of the society (e.g. officials, banks, and companies) adjust their behaviours after the announcement of five-year plans (The Economist, 2021). Considering the social atmosphere, the five-years-ahead income expectations are meaningful for understanding household financial and economic behaviours.

[19] The expectation question is asked at the end of the household questionnaires after detailed household information (including income) is collected.

have a quasi-probability game). Meanwhile, the final expectation results are not exact point estimates when the household members only choose the possible scenario with the highest likelihood rather than providing a predicted number. Such manipulation in subjective surveys does not require the respondents to have any knowledge about mathematical probability.

Among the four scenarios provided, the first two qualifiers, a big increase and a small increase, are likely to convey ambiguous information to different respondents; in other words, different respondents have different cognitive understandings of the distinctions between big increases and small increases of future income. As Bruine de Bruin and Fischhoff (2017) analyse in their research, the overestimation and underestimation issues in eliciting expectations of future life events and future outcomes are common concerns in the judgement processes, especially when the given qualifiers are ambiguous. Even though the questions have an implicit vignette to guide the household members to choose an option describing the changes in future income in five years compared with current income, there still exists ambiguity to some extent.

The expectation questions are identical for the three groups, consistent with the separate studies of income expectations. As Figure 2.7 shows, the share of the individuals choosing a big increase in future household incomes to the whole sample is much smaller than that of people choosing a small increase, indicating that among the optimistic respondents, only a small ratio thought that the marginal future household income would be very large. The investigators intended to capture the magnitude of

optimism but failed to capture the range of pessimism, resulting in the asymmetric structure of the options.[20]

For the convenience of analysis, this study aggregates the two increase categories into one, considering the ratios of the big increase category are small and the ambiguous definition of these two qualifiers, as discussed above. This is an artificial intervention to eliminate potential ambiguity originating from the unclear definition in the question itself and enhance the comparability among different regions and groups, discussed in the literature review section. Following the method of Frijters *et al.* (2012), in the empirical part of this chapter, the income expectation variable is recoded into three dummy variables for three different types of expectations. Each of the three dummy variables equals one if the households fall into the corresponding type of income expectations represented by the dummy and 0 otherwise.

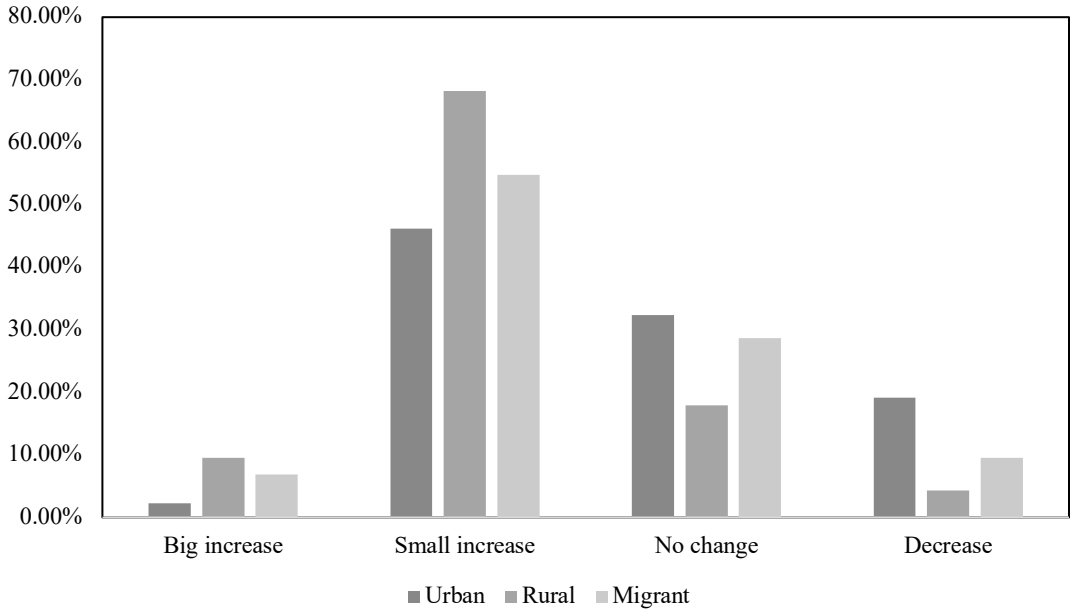
From the distribution shown in Figure 2.7, a sizable proportion of the interviewed households expected their income position to increase in five years. In detail, from the datasets used in this chapter, around 49% of the investigated urban households, 77.69% of the rural households, and 61.70% of the migrant households expected an increase in income. The pattern of the income expectations signals a 'positive' response pattern with a higher proportion of respondents inclined to provide positive answers showing optimistic attitudes toward expected financial income status.[21] This is different from the typical 'neutral'

[20] The survey shows that the respondents choosing the decrease category account for a very small fraction; perhaps this was predictable in the questionnaire designing process considering the country's rapid growth during that period. Thus, it is meaningless to divide the decrease category into further sub-categories.

[21] As described in the introductory section, the countries with the middle inflation response pattern experience relatively smooth changes compared with the two listed countries, China and India. Whether the trend of

response pattern in Brown *et al.* (2023), with most answers being neutral. Brown *et al.* (2023) indicate that the persistence in eliciting expectations partially stems from the stability of influencing factors of income expectations, like economic growth, inflation, savings, etc.

Figure 2.7 Distribution of reported income expectations



Source: The 2002 Chinese Household Income Project

Apart from income expectations, this chapter also controls household permanent income level, household income position and other household-specific characteristics that may influence the household financial decisions on savings, debt and expenditures. First, the inclusion of permanent income aligns with the discovery of a dependency relationship between household saving rates and permanent income level in India (Bhalla, 1980), showing that permanent income influences household

household financial indicators can represent the intrinsic exponential structure is waiting for further discussions and research.

financial decisions. This chapter follows the Klein nonlinearity form proposed by Klein in 1954 (Klein, 1954), using the financial ratios as the dependent variable and the log form of permanent income as the explanatory variable. The process for constructing the permanent income variables is outlined in Section 2.4.

Second, financial position is also included in the empirical analysis. Income position is a contributory factor influencing household financial behaviours in holding financial assets and being indebtedness; households with higher financial position aggregately have relatively higher saving rates (Denizer *et al.*, 2002) and are more likely to be indebted (Hake and Poyntner, 2019) in the European countries. Therefore, income distribution can be used to study whether household financial position influences household financial decisions, i.e., whether the change of financial position impacts the desired saving-to-income ratios. This chapter introduces a set of income dummies to represent households with different income levels to control for household income positions. In detail, all observations are divided into four income quartiles based on total annual household income. In the statistical analysis, the first income dummy standing for the lowest income quartile is omitted as the reference category.

Third, because this empirical study is conducted at the household level, household characteristics are also key contributory factors. Following the model specification of the determinants of household financial pressures in Brown and Taylor (2008), several characteristics of the household head and some family-related variables are used. The household head characteristics include age, gender, marital status and ethnicity of the household head, as shown in Table 2.6. This chapter uses a set of age dummy

variables indicating household heads aged 18-30, 30-40, 40-50 and 50-60, respectively, with the age category comprising household heads aged 60 and above omitted from the regression as the reference category. Furthermore, three demographic dummies are incorporated, including whether the household head is married, whether the household head is a minor ethnic citizen (not a Han citizen) and female.

Apart from these head-specific characteristics, some household-related variables are incorporated into the empirical analysis, as shown in Table 2.6. This chapter also controls the household size (the number of household members), the years of education that the household member with the highest educational attainment has, the number of household members that are employed, and a dummy variable indicating whether any household member having bad health status (the dependency of household members due to health issues).

Table 2.6 Details of the dependent variables and the explanatory variables

Dependent variables	
Expenditure-to-income ratios	The ratios of total household annual consumption on both durable goods and nondurable goods to total household annual income.
Durable-to-income ratios	The ratios of total household annual consumption on durable goods to total household annual income (not applicable to the rural part due to the availability of data).
Nondurable-to-income ratios	The ratios of total household annual consumption on nondurable goods to total household annual income (not applicable to the rural part due to the availability of data).
Asset-to-income ratios	The ratios of total household financial assets to total household annual income.
Debt-to-income ratios	The ratios of total household financial debt to total household annual income.
Explanatory variables	
Income expectation (no change)	A dummy variable: 1 if the respondent thinks the household total income will not change in five years and 0 otherwise.
Income expectation (increase)	A dummy variable: 1 if the household member answering the income expectation question thinks the household total income will increase in five years and 0 otherwise.
The log of permanent income	This variable is manually estimated to capture the component of income contributable to permanent shocks. The methods of estimation are introduced in Section 2.4.1.
Female household head	A dummy variable: 1 if the household head is female.
Total household income position dummies	A set of dummies indicating household income position: (1) Total household income 25-50th percentile; (2) Total household income 50-75th percentile; (3) Total household income 75-100th percentile.
Household head age dummies	A set of dummies indicating the age of household head: (1) Household head aged 18-30; (2) Household head aged 30-40; (3) Household head aged 40-50; (4) Household head aged 50-60.
Household size	The number of household members of each household.
Marital status of household head	A dummy variable: 1 if the household head is married and 0 otherwise.
Minor ethnicity of household head	A dummy variable: 1 if the household head is a minority citizen and 0 otherwise.
No. of household members being employed	A number indicating how many household members are employed.
Bad health status	A dummy variable: 1 if there is any household member suffering bad health and 0 otherwise. Household members are asked to self-assess their health status with five options from very healthy to very bad. If any members are reported to have bad or very bad health, the variable is coded as 1 and 0 otherwise.
Household highest educational attainment	The number of education years of the household member who has the highest educational schooling years.

Table 2.7 Summary statistics

Variable	Urban	Rural	Migrant
	Mean	Mean	Mean
Consumption-to-income ratios (total)	0.849	0.917	0.880
Consumption-to-income ratios (durable)	0.709		0.514
Consumption-to-income ratios (nondurable)	0.140		0.366
Asset-to-income ratios	1.657	0.768	0.941
Debt-to-income ratios	0.248	0.197	0.182
Income expectation (no change)	0.323	0.180	0.287
Income expectation (decrease)	0.191	0.043	0.095
Female household head	0.328	0.040	0.206
Total household income 25-50th percentile	0.250	0.250	0.268
Total household income 50-75th percentile	0.250	0.250	0.261
Total household income 75-100th percentile	0.250	0.250	0.221
Household head aged 18-30	0.022	0.029	0.237
Household head aged 30-40	0.227	0.263	0.494
Household head aged 40-50	0.354	0.328	0.180
Household head aged 50-60	0.238	0.269	0.067
Household size	3.020	4.164	2.677
Marital status of household head	0.941	0.959	0.907
Minor ethnicity of household head	0.039	0.123	0.088
No. of household members being employed	1.503	2.467	1.728
Bad health status	0.131	0.166	0.053
Household highest educational attainment	12.375	9.027	8.849

The description of the dependent and explanatory variables is shown in Table 2.6, and the summary statistics of these variables are reported in Table 2.7. Remarkably, the average value of the asset-to-income ratio (1.657) is approximately seven times that of the average debt-to-income ratio (0.248) for urban households. For rural households, the average value of the asset-to-income ratio (0.768) is around four times that of the average debt-to-income ratio (0.197). For migrant households, the average value of the asset-to-income ratio (0.941) is approximately seven times that of the average debt-to-income ratio (0.182). The average consumption-to-income ratios are 0.849 for urban households, 0.917 for rural households, and 0.88 for migrant households, close to unity. This indicates that most household income is used to satisfy consumer needs. Besides, the durable consumption-to-income ratio is higher than the nondurable consumption-to-income ratio.

In addition, from Table 2.7, more urban households expect household income to be constant or increase in 5 years, compared with rural and migrant households. The average value of the income expectation variables represents the proportion of households choosing specific answers to income expectation questions. The mean of the income expectation variable representing households expecting unchanged household income is 0.323 for urban households, 0.180 for rural households, and 0.287 for migrant households. This implies that 32.3% of urban households, 18% of rural households, and 28.7% of migrant households expect their household income to remain unchanged for five years. Similarly, 19.1% of urban households, 4.3% of rural households, and 9.5% of migrant households expect their household income to increase in five years.

2.4 Empirical Analysis

2.4.1 Decomposition of household income

This section introduces the methods of constructing permanent income at the household level to isolate permanent income from total household income. There are at least two strategies to model permanent income at the household level: the statistical approach using the realisation data of household income and the econometric approach using the fitted values of proposed permanent income models.

Many researchers use the average household-level income of multiple years to proxy permanent income. Sabelhaus and Groen (2000) use the average annual household income of ten years to measure the permanent income at the household level, reconciling the longitudinal income data of each household or each household member with other cross-sectional data. Another reason that averaging income for multiple periods can effectively average out transitory unanticipated income-related factors, *Rohde et al.* (2010) and Martinez (2015) directly define permanent income as the long-run average yearly income, indexing the permanent income by calculating the arithmetic mean of the annual income over multiple periods.

In this chapter, the arithmetic approach with historical income data for multiple years is employed to measure permanent income at the household level by averaging household annual income levels over all available years from the CHIP (5 years in this chapter). This method is exclusively applied to urban and rural households because there is no record of the individual or household income of previous years for the migrant sample. The second device is to approximate household permanent income using the fitted values of proposed household income models. Of the existing econometric models, one of the most commonly used is the Mincerian earnings equation of labour economics, Mincer (1974). Lefgren *et al.* (2012) use the Mincerian method to distinguish the components of permanent income related to human capital from other components to identify the influences of human capital. Generally, the

Mincerian variables capture the intrinsic characteristics of individuals, including age, education, experience ("post-school education"), etc.

There are several advantages of this model. First, one of the advantages of Mincer-type approaches is that they can be augmented based on the demands of research questions. For example, to study the income discrimination questions, Gravemeyer *et al.* (2011) augment the basic model by adding discriminatory variables to isolate the impact of discrimination factors with the standard Mincer models as the reference model. Second, it is also worth noting that this Mincerian method can be applied to both cross-sectional and panel data. In this analysis, even if only one wave of the survey is used, the socioeconomic characteristics used in this method are relatively stable over the years. For example, it is easy to obtain the respondent's age of previous years from the reported age in the survey.

Following the decomposition method used in Chamon *et al.* (2013), in this chapter, the Mincerian OLS regressions are used to derive the permanent components of the individual incomes from the observed characteristics of the recorded individuals. The preferred specification of this chapter is to regress the natural logarithm of income at the individual or household level on gender, age, age squared, educational dummies, occupational dummies and the interaction terms of educational and occupational dummies. For the urban and rural subgroups, the datasets contain income information for multiple years from 1998 to 2002. Hence it is feasible to use the longitudinal income data to construct panel sub-datasets with information on gender, age, education and occupation. Such manipulation can, to some extent, efficiently average the variations attributable to yearly economy-wide factors.

Considering the difference in available data for the three subgroups, different strategies are adopted to estimate permanent income. For the urban respondents, this wave includes the individual income of each household member from 1998 to 2002 and all respondents' characteristics. Therefore, for this subgroup, the permanent income of each household member is constructed first. Then the household permanent income is the sum of all estimated individual permanent income within the household. For

the rural and migrant subgroups, only total household income in the current year is reported in the datasets. Hence it is not possible to measure the individual permanent income.

Personal characteristics are replaced with the characteristics of household heads to approximate household permanent income. An important point to be mentioned is that different from the urban and rural households, only 0.47% of the migrant respondents have obtained a degree, and 0.65% of the household heads have a higher education degree. For this reason, a new set of educational dummies are used for the estimation of the permanent income of migrant households (two dummy variables for finishing high school education or above and finishing middle school education, respectively).

In detail, for urban households, first regress the natural logarithm of individual annual income on the specified variables:

$$\log(X_{ijt}) = \beta_0 + \beta_1 \text{gender}_{ijt} + \beta_2 \text{age}_{ijt} + \beta_3 age_{ijt}^2 + \sum_{k=1}^{3} \gamma_k E_{kijt} + \sum_{g} \alpha_g O_{gijt} + \sum_{i=1}^{3} \sum_{g} \eta_{ig} E_{kijt} \times O_{gijt} + v_{ijt} \quad (2.1)$$

where X_{ijt} is the annual income of the jth household member in the household i at year t; gender_{ijt} and age_{ijt} are the gender dummy (0 if the individual is female and 1 if male) and age of this individual respectively; E_{kijt} and O_{gijt} stand for the education dummies (schooled without degree and with degree), with individuals who never attended school as the reference group, and the occupation dummies for different occupational types; $E_{kijt} \times O_{gijt}$ represents their interaction terms; and v_{ijt} is the error term. βs, γs, αs and ηs are coefficients.

After estimating the individual income, their permanent income (PI_{ij}) is proxied by the average of the fitted values of individual income for the five years ($PI_{ij} = \frac{\sum \widehat{X_{ijt}}}{5}$). Then, within the household, the permanent income of all household members is added to get the permanent income of the household (PI_i). After deriving the predicted permanent income of each year, the final household permanent income is the average value of all estimated permanent incomes for each household member.

Turning to the rural households, a similar method is used, where the natural logarithm of household annual income (X_{it}) is regressed on the corresponding characteristic variables related to the household head. The equation is:

$$\log\left(X_{it}^{hh}\right) = \beta_0 + \beta_1 \text{gender}_{it}^{hh} + \beta_2 \text{age}_{it}^{hh} + \beta_3 age_{it}^{hh\,2} + \sum_{k=1}^{3} \gamma_k E_{kit}^{hh} + \sum_{g} \alpha_g O_{git}^{hh} + \sum_{i=1}^{3} \sum_{g} \eta_{ig} E_{kit}^{hh} \times O_{git}^{hh} + v_{it} \quad (2.2)$$

where all control variables are the characteristics of the household head. After the regression, the exponential results of the fitted values are the predicted values of household permanent income for five years, which are averaged to derive the permanent income of rural households. Finally, for the migrant households, due to the available household income information pertaining to a single year, the income equation is applied to cross-sectional data. One concern is the reason for applying different strategies to estimate permanent income for urban, rural and migrant households. As discussed in the data section, there are income data for all household members of urban households. However, for rural and migrant households, there is only the total household income of each family. It is not plausible to derive the income level of household heads for urban and rural residents. Thus, this chapter cannot model the permanent income of household heads.

The estimation results of permanent income are shown in Table 2.8. The estimated coefficients of gender are statistically significant at 1% or 5% significance level. The gender coefficient for urban households is positive, while the gender coefficients for rural and migrant households are negative. This indicates that for urban residents, male residents, on average, have higher annual earnings than female residents. For rural and migrant households, households with a male head, on average, have lower annual earnings than households with a female head. Looking at the coefficients of age and age squared, the estimation results show an inverted U-shape relationship between age and the corresponding income levels. In addition, the mean values of the logarithm of the predicted permanent income are 9.475, 8.935 and 9.437 for urban, rural and migrant samples, respectively.

Table 2.8 Estimation results of permanent income models

Variable	Urban		Rural		Migrant	
	The log of individual annual income		The log of household annual income		The log of household annual income	
Gender (0, if female; 1 if male)	0.153***	(0.022)	-0.205***	(0.032)	-0.084**	0.041
Age (Individual/ Household head)	0.256***	(0.004)	0.065***	(0.003)	0.105***	0.011
Age^2 (Individual/ Household head)	-0.002***	(0.000)	-0.001***	(0.000)	-0.001***	0.000
Education - Schooled	0.583	(0.711)	-0.047	(0.071)		
Education - Degree	1.878**	(0.869)	-0.132	(0.147)		
Education – High school and above					0.141***	0.052
Education – Middle school					0.147**	0.070
Occupation Dummies	Yes		Yes		Yes	
Interaction terms of educational and occupational dummies	Yes		Yes		Yes	
R squared	0.166		0.033		0.157	
Observations	71081		45148		1482	

Standard errors in parentheses.

* p<0.10 ** p<0.05 *** p<0.01

2.4.2 Methodology

This chapter uses two types of linear regression models, the Ordinary Least Squares (OLS) model and the Tobit censored linear regression model, depending on whether the outcome of interest is a continuous or censored dependent variable, to investigate the determinants of the consumption-to-income ratios, the asset-to-income ratios and the debt-to-income ratios for the urban, the rural and the migrant groups at household level respectively.[22] The OLS regression is employed to estimate the relationship between explanatory variables and the consumption-to-income ratios, which are continuous, as shown in Figure 2.4, Figure 2.5 and Figure 2.6:

$$\left(\frac{Y}{I}\right)_i = \alpha + \beta_1 IE_{1i} + \beta_2 IE_{2i} + \beta_3 PI_i + \boldsymbol{\theta X} + \boldsymbol{\gamma P} + \varepsilon_i \quad (2.3)$$

where $\left(\frac{Y}{I}\right)_i$ stands for the expenditure-to-income ratios, the durable-to-income ratios or the nondurable-to-income ratios of household i; IE_{1i} and IE_{2i} are the two income expectation dummy variables for the unchanged category and the decreasing category respectively; PI_i is the estimated permanent income from the linear regression or the proxied permanent income by averaging the household income of the past 5 years; $\boldsymbol{X}$ is a vector of control variables (excluding expectations and permanent income); and $\boldsymbol{P}$ represents the provincial dummies capturing the fixed regional effects. See Table 2.6 for the description of dependent variables and independent variables.

As shown in the histograms (Figure 2.4, Figure 2.5 and Figure 2.6), there are apparent spikes on the left in the distribution diagrams of the financial assets and the financial debt for all three subgroups. This

[22] Alternative econometrics methods, such as probit models and double hurdle models, are also worth consideration given the high proportions of boundary values for some dependent variables. However, similar to Andries and Hünermund (2014), this chapter assumes that the boundary values occur naturally and there is not a separate mechanism forcing the formation of boundaries at the ends of the distribution of dependent variables.

implies that there is a significant proportion of households surveyed in all of the three subgroups not having any financial assets or debt. For these households, the corresponding asset or debt variables are coded zero in the datasets, which indicates the asset and debt variables have a lower censoring boundary, 0, in this case. Considering that these two variables are the numerator of the asset-to-income and debt-to-income ratios, the two ratio variables are then censored at 0.

To deal with the lower censoring target variables, a commonly used device is the Tobit model. After employing the standard Tobit model, the determinants of household financial pressures, indicated by the asset-to-income ratios and the debt-to-income ratios (Cox *et al.*, 2002), can be explained from two aspects: the likelihood (i.e. probability) of possessing any financial asset or debt (extensive margins) and the exact magnitude conditional on being uncensored (intensive margins). The focus of this chapter is to find out to what extent the ratios of financial assets and debt with respect to household income are influenced by income expectation and permanent income at both the extensive and intensive margins.

Continuing with the standard Tobit censoring regression model, assume that the asset-to-income and debt-to-income ratios are determined by a linear process, similar to the equation above:

$$\left(\frac{A}{I}\right)_i^* = \alpha + \beta_1 IE_{1i} + \beta_2 IE_{2i} + \beta_3 PI_i + \boldsymbol{\theta X} + \boldsymbol{\gamma P} + \varepsilon_i \quad (2.4)$$

where $\left(\frac{A}{I}\right)_i$ is the financial assets to income ratios of household i. $\left(\frac{A}{I}\right)_i = \left(\frac{A}{I}\right)_i^*$ if the asset-to-income ratios are positive; otherwise, $\left(\frac{A}{I}\right)_i = 0$. Similarly,

$$\left(\frac{D}{I}\right)_i^* = \alpha + \beta_1 IE_{1i} + \beta_2 IE_{2i} + \beta_3 PI_i + \boldsymbol{\theta X} + \boldsymbol{\gamma P} + \varepsilon_i \quad (2.5)$$

where $\left(\frac{D}{I}\right)_i$ is the financial debt to income ratios of household i. $\left(\frac{D}{I}\right)_i = \left(\frac{D}{I}\right)_i^*$ if the debt-to-income ratios are positive; otherwise, $\left(\frac{D}{I}\right)_i = 0$. Note that, apart from the dependent variables, the definitions of explanatory variables are consistent through all models of the three groups. IE is the income expectation, PI is the household permanent income, $\mathbf{X}$ stands for a set of control variables, and $\boldsymbol{P}$ controls for regional effects. See Table 2.6 for the description of dependent variables and independent variables.

After running the standard Tobit regression, there are two dimensions to analyse the determinant factors of the asset-to-income ratios and the debt-to-income ratios, namely the extensive margin and the intensive margin. The probability of possessing any financial asset or being indebted (the extensive margin) is the probability of the household asset-to-income ratios or the household debt-to-income ratios being greater than zero. From the marginal effects at the extensive margin, it is reasonable to find out, ceteris paribus, whether the change of a specific variable will change the likelihood of households holding any financial asset or debt. A corresponding device is the marginal effects at the intensive margin. The intensive margin is the exact numerical value of the ratios conditional that the ratios are positive (i.e., non-zero). By analysing the marginal effects at the intensive margin, it is possible to find out, given that the dependent variables are positive, how the variables of interest determine the expected changes of target ratios, the asset-to-income ratios and the debt-to-income ratios in this chapter. This chapter will report the marginal effects at the extensive margin and at the intensive margin at the same time to decompose the joint effects involved in the Tobit model. The three sub-sections below discuss the results for household consumption, household financial assets and household financial debt.

2.4.3 Regression results for household consumption

Table 2.9, Table 2.10 and Table 2.11 present the results of estimating the determinants of household consumption behaviours (the total-consumption-to-income ratios, the durable-to-income ratios and the nondurable-to-income ratios) using OLS regressions for urban households, rural households and migrant households respectively. Regarding the primary variable of interest in this chapter (income expectations), for urban households, compared with the optimistic households toward their future household income (the reference category), neutral and pessimistic households, on average, have higher expenditure-to-income ratios, durable-to-income ratios and nondurable-to-income ratios given the positive and significant coefficients of both expectation variables in Table 2.9. This suggests that neutral and pessimistic urban residents allocate a larger proportion of household income to consumption (total, durable, and nondurable).

Conversely, compared to urban households, the estimation results of consumption models for rural households do not provide any evidence to support that income expectations significantly determine the consumption decisions of rural households due to the insignificance of the income expectation coefficients of household consumption for rural households. Furthermore, for the migrant households, there is no difference between the optimistic households and the neutral households. In contrast, pessimistic households tend to reduce their expenditures (on all goods, durable goods, and nondurable goods) given certain income levels. This is consistent with the empirical finding of Brown *et al.* (2023) that financial optimism is positively associated with consumption. In summary, for pessimistic households expecting household income to decrease, urban households on average spend a higher fraction of total household income on consumption (total, durable and nondurable). In comparison, pessimistic migrant households on average have a lower fraction, and pessimistic rural households on average have the same fraction, keeping other determinants constant.

Table 2.9 Determinants of household expenditures/income (OLS) - urban

Statistic	Household expenditures/Income				Household durable Expenditures/Income				Household nondurable Expenditures/Income			
Intercept	1.527***	(0.343)	2.756***	(0.334)	1.142***	(0.194)	2.261***	(0.251)	0.385**	(0.157)	0.495***	(0.129)
Income expectation (= no change)	0.035***	(0.013)	0.035***	(0.013)	0.027**	(0.010)	0.027**	(0.010)	0.032**	(0.007)	0.032**	(0.007)
Income expectation (= decrease)	0.040**	(0.023)	0.040**	(0.023)	0.036**	(0.017)	0.035**	(0.017)	0.029*	(0.009)	0.030*	(0.009)
Household permanent income (log) type 1	-0.101	(0.040)			-0.082*	(0.022)			-0.091	(0.018)		
Household permanent income (log) type 2			-0.195***	(0.035)			-0.209***	(0.027)			-0.080**	(0.014)
Female household head (1 if yes)	0.026**	(0.015)	0.022*	(0.015)	0.031**	(0.012)	0.028**	(0.012)	0.004	(0.006)	0.001	(0.006)
Total household income 25-50th percentile	-0.171***	(0.019)	-0.116***	(0.019)	-0.188***	(0.016)	-0.126***	(0.016)	-0.062***	(0.008)	-0.044***	(0.008)
Total household income 50-75th percentile	-0.238***	(0.020)	-0.141***	(0.025)	-0.271***	(0.016)	-0.164***	(0.021)	-0.068***	(0.008)	-0.034*	(0.010)
Total household income 75-100th percentile	-0.320***	(0.023)	-0.169***	(0.038)	-0.368***	(0.018)	-0.202***	(0.030)	-0.084***	(0.010)	-0.030	(0.015)
Household head aged 18-30	-0.001	(0.065)	0.015	(0.043)	0.007	(0.044)	0.018	(0.034)	-0.015	(0.029)	0.003	(0.021)
Household head aged 30-40	0.032	(0.040)	0.057***	(0.028)	0.055**	(0.028)	0.071***	(0.022)	-0.025	(0.017)	0.004	(0.011)
Household head aged 40-50	0.059***	(0.023)	0.058***	(0.022)	0.096***	(0.018)	0.092***	(0.018)	-0.037*	(0.010)	-0.030	(0.010)
Household head aged 50-60	0.027	(0.026)	0.018	(0.026)	0.028	(0.018)	0.018	(0.017)	0.013	(0.013)	0.009	(0.012)
Household size	0.028**	(0.008)	0.038***	(0.008)	0.049***	(0.006)	0.059***	(0.006)	-0.024**	(0.003)	-0.019*	(0.003)
Marital status of household head	-0.018	(0.056)	-0.018	(0.051)	-0.017	(0.045)	-0.015	(0.043)	-0.010	(0.019)	-0.016	(0.017)
Minor ethnicity of household head (1 if yes)	0.006	(0.026)	0.007	(0.026)	0.003	(0.021)	0.004	(0.021)	0.010	(0.012)	0.010	(0.012)
No. of household members employed	-0.037**	(0.012)	-0.056***	(0.012)	-0.045***	(0.009)	-0.058***	(0.009)	-0.005	(0.005)	-0.028*	(0.005)
Any household members with bad health	0.048***	(0.021)	0.049***	(0.021)	0.060***	(0.017)	0.060***	(0.017)	0.005	(0.008)	0.005	(0.008)
Highest education attainment (years)	0.074***	(0.003)	0.083***	(0.002)	0.084***	(0.002)	0.096***	(0.002)	0.023	(0.001)	0.022	(0.001)
Provincial fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
R squared	0.105		0.107		0.123		0.129		0.029		0.025	
Observations	6810											

Standardised beta coefficients; Standard errors in parentheses.
Type 1 permanent income: predicted values derived from the permanent income regression.
Type 2 permanent income: average household total income of 5 years.
* p<0.10 ** p<0.05 *** p<0.01

Table 2.10 Determinants of household expenditures/income (OLS) - rural

Statistic	Household expenditures/Income (OLS)			
Intercept	-2.969	(2.525)	3.035**	(1.342)
Income expectation (= no change)	-0.034	(0.029)	-0.045	(0.031)
Income expectation (= decrease)	0.152	(0.147)	0.154	(0.148)
Household permanent income (log) type 1	0.427	(0.266)		
Household permanent income (log) type 2			-0.263*	(0.145)
Female household head (1 if yes)	-0.031	(0.085)	0.067	(0.071)
Total household income 25-50th percentile	-0.703***	(0.115)	-0.588***	(0.128)
Total household income 50-75th percentile	-0.861***	(0.140)	-0.666***	(0.169)
Total household income 75-100th percentile	-1.090***	(0.161)	-0.780***	(0.221)
Household head aged 18-30	0.538**	(0.219)	0.282*	(0.157)
Household head aged 30-40	0.251**	(0.098)	0.131**	(0.051)
Household head aged 40-50	0.239***	(0.079)	0.206***	(0.069)
Household head aged 50-60	0.053	(0.058)	0.054	(0.061)
Household size	0.064***	(0.022)	0.068***	(0.022)
Marital status of household head	-0.063	(0.194)	-0.023	(0.188)
Minor ethnicity of household head (1 if yes)	-0.069	(0.051)	-0.054	(0.055)
No. of household members employed	0.019	(0.035)	0.026	(0.035)
Any household members with bad health	0.107**	(0.054)	0.104*	(0.056)
Highest education attainment (years)	0.040***	(0.013)	0.045***	(0.014)
Provincial fixed effects	Yes		Yes	
R squared/ Pseudo R squared	0.035		0.037	
Observations	9147		8887	

Standardised beta coefficients; Standard errors in parentheses.

Type 1 permanent income: predicted values derived from the permanent income regression.

Type 2 permanent income: average household total income of 5 years.

* p<0.10 ** p<0.05 *** p<0.01

Table 2.11 Determinants of household expenditures/income (OLS) – migrant

Statistic	Household expenditures/Income (OLS)		Household durable Expenditures/Income (OLS)		Household nondurable Expenditures/Income (OLS)	
Intercept	-3.073***	(1.119)	-3.014***	(0.692)	-0.059	(0.615)
Income expectation (= no change)	-0.010	(0.052)	-0.019	(0.034)	0.005	(0.023)
Income expectation (= decrease)	-0.055***	(0.055)	-0.063***	(0.037)	-0.032**	(0.025)
Household permanent income (log)	0.122***	(0.140)	0.163***	(0.084)	0.033	(0.078)
Female household head (1 if yes)	-0.071***	(0.052)	-0.062***	(0.033)	-0.069***	(0.023)
Total household income 25-50th percentile	-0.329***	(0.111)	-0.291***	(0.073)	-0.312***	(0.047)
Total household income 50-75th percentile	-0.403***	(0.121)	-0.355***	(0.081)	-0.384***	(0.050)
Total household income 75-100th percentile	-0.458***	(0.140)	-0.395***	(0.091)	-0.451***	(0.059)
Household head aged 18-30	-0.018	(0.184)	-0.070	(0.167)	0.064	(0.054)
Household head aged 30-40	-0.047	(0.194)	-0.114	(0.170)	0.063	(0.066)
Household head aged 40-50	0.007	(0.190)	-0.060	(0.171)	0.105**	(0.061)
Household head aged 50-60	-0.044	(0.182)	-0.075	(0.169)	0.012	(0.049)
Household size	0.138***	(0.036)	0.127***	(0.020)	0.123***	(0.019)
Marital status of household head	-0.014	(0.148)	-0.020	(0.080)	-0.002	(0.073)
Minor ethnicity of household head (1 if yes)	0.039	(0.092)	0.021	(0.052)	0.058*	(0.055)
No. of household members employed	0.014	(0.042)	0.034	(0.028)	-0.017	(0.019)
Any household members with bad health	0.078**	(0.175)	0.105**	(0.128)	0.020	(0.086)
Highest education attainment (years)	0.040	(0.011)	0.044*	(0.007)	0.024	(0.006)
Provincial fixed effects	Yes		Yes		Yes	
R squared/ Pseudo R squared	0.163		0.146		0.150	
Observations	1913		1913		1913	

Standardised beta coefficients; Standard errors in parentheses.

* p<0.10 ** p<0.05 *** p<0.01

Furthermore, it is often argued that consumption is proportional to permanent income under the permanent income hypothesis and that consumption can be inter-temporally smoothed, for example, by borrowing and lending, under the consumption smoothing assumption. As described in section 2.4.1, two methods are used to measure permanent income at the household level: the first is derived from the fitted values of proposed permanent income equations (type 1 permanent income), and the second is the arithmetic mean of the realised income data (type 2 permanent income). Looking at urban and rural households, from the estimation results of permanent income variables in Table 2.9 and Table 2.10, there are obvious differences between the estimated coefficients of models with type 1 permanent income (predicted values derived from the permanent income regressions) and type 2 permanent income (average total household income of 5 years). The type 1 permanent income is exclusively statistically significant in the durable-to-income model with 90% confidence for urban households, indicating that a 1% increase in the household permanent income will lead to a decrease in household durable consumption accounting for 8.2% of total household income.

By contrast, the type 2 permanent income is significant in the estimation results for urban households at 1% or 5% significance level and significant for rural households at 10% significance level. The results suggest that a 1% increase in type 2 permanent income is associated with a decrease in total household expenditures accounting for 19.5% of total household income, a decrease in durable expenditures accounting for 20.9% of total household income, and a decrease of household nondurable expenditures accounting for 8% of total household income for urban households. Similarly, a 1% increase in type 2 permanent income is associated with a decrease in total household expenditures, accounting for 26.3% of total household income for rural households. The results are in accordance with the existing literature, which indicates household consumption, both durable and nondurable, responds to income shocks, thus smoothing consumption over time, e.g., Smith (1962), Pistaferri (2001), Jappelli and Pistaferri (2010), Agarwal and Qian (2014) and Misra and Surico (2014).

Turning to other covariates in Table 2.9 and Table 2.10, for both urban and rural sub-samples, households with any member having health issues, with more members, or with a better-educated head are more likely to spend a higher fraction of household income on durable goods and to incur higher levels of total consumption over household income. The results also show that urban households with young and old heads spend a smaller proportion of household income, which ties in with Chamon and Prasad (2010). This finding is not apparent for rural households. Finally, the negative and significant coefficients of income position dummies on the consumption-to-income ratios of all three types demonstrate that households in higher quartiles spend less on both durable and nondurable consumption. A rationale is that richer households do not need to spend high proportions of household income to meet essential consumptive needs and have more financial capabilities to meet other demands, i.e., purchasing house properties and investing in financial markets. Evidence can be found in the results for the asset-to-income ratios and the debt-to-income ratios in the following sections.

2.4.4 Regression results for household financial assets

The results of Tobit regressions of urban, rural and migrant households on the asset-to-income ratios, with the average marginal effects at the extensive and intensive margins, are provided in Table 2.12, Table 2.13 and Table 2.14. The average marginal effects at the extensive margin estimate the effect on the likelihood of having any financial asset, and the average marginal effects at the intensive margin suggest the effect on the values of household financial asset-to-income ratios conditional on having positive financial assets. Panel A of Table 2.12 and Table 2.13 displays the estimated results of models using the type 1 permanent income (the fitted values of proposed permanent income equations). Panel B of Table 2.12 and Table 2.13 displays the estimated results of models using the type 2 permanent income (the arithmetic mean of the realised income data).

Table 2.12 Determinants of financial assets/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – urban

Statistic	Panel A: financial assets/income ratios with estimated permanent income (type 1)						Panel B: financial assets/income ratios with 5-year average household income (type 2)					
	Coefficients		ME at extensive margin		ME at intensive margin		Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	5.787	(3.809)					-9.031***	(2.499)				
Income expectation (= no change)	-0.141	(0.093)	-0.012*	(0.007)	-0.063	(0.040)	-0.124	(0.090)	-0.011	(0.007)	-0.055	(0.039)
Income expectation (= decrease)	0.211	(0.195)	0.019	(0.015)	0.094	(0.084)	0.216	(0.198)	0.019	(0.015)	0.096	(0.085)
Household permanent income (log)	-0.567	(0.456)	-0.050	(0.030)	-0.253	(0.192)	1.132***	(0.271)	0.099***	(0.035)	0.504***	(0.129)
Female household head (1 if yes)	0.149*	(0.087)	0.013	(0.009)	0.067	(0.041)	0.100	(0.106)	0.009	(0.011)	0.045	(0.049)
Total household income 25-50th percentile	0.252	(0.157)	0.022*	(0.012)	0.112*	(0.067)	-0.351**	(0.140)	-0.031**	(0.015)	-0.156**	(0.064)
Total household income 50-75th percentile	0.252*	(0.148)	0.022**	(0.010)	0.113*	(0.062)	-0.712***	(0.199)	-0.062***	(0.024)	-0.317***	(0.094)
Total household income 75-100th percentile	0.425**	(0.204)	0.037***	(0.013)	0.190**	(0.084)	-1.027***	(0.302)	-0.090**	(0.037)	-0.457***	(0.143)
Household head aged 18-30	-0.974	(0.650)	-0.085**	(0.043)	-0.434	(0.272)	0.010	(0.213)	0.001	(0.019)	0.004	(0.095)
Household head aged 30-40	-0.188	(0.354)	-0.017	(0.028)	-0.084	(0.155)	0.433***	(0.164)	0.038***	(0.012)	0.193***	(0.068)
Household head aged 40-50	0.406**	(0.184)	0.036*	(0.019)	0.181**	(0.084)	0.669***	(0.186)	0.059***	(0.015)	0.298***	(0.076)
Household head aged 50-60	0.528**	(0.242)	0.046***	(0.014)	0.236**	(0.098)	0.592**	(0.244)	0.052***	(0.013)	0.264***	(0.097)
Household size	-0.202***	(0.062)	-0.018***	(0.004)	-0.090***	(0.025)	-0.223***	(0.053)	-0.020***	(0.004)	-0.100***	(0.021)
Marital status of household head	0.353	(0.292)	0.031	(0.021)	0.158	(0.124)	-0.046	(0.174)	-0.004	(0.015)	-0.021	(0.078)
Minor ethnicity of household head (1 if yes)	0.142	(0.145)	0.012	(0.013)	0.063	(0.064)	0.135	(0.141)	0.012	(0.012)	0.060	(0.062)
No. of household members employed	0.002	(0.114)	0.000	(0.010)	0.001	(0.051)	-0.252**	(0.104)	-0.022***	(0.006)	-0.112***	(0.042)
Any household members with bad health	-0.255**	(0.115)	-0.022***	(0.008)	-0.114**	(0.048)	-0.275**	(0.121)	-0.024***	(0.008)	-0.122**	(0.050)
Highest education attainment (years)	0.0817***	(0.025)	0.007***	(0.001)	0.037***	(0.009)	0.047***	(0.017)	0.004***	(0.001)	0.021***	(0.007)
Provincial fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Pseudo R squared	0.005						0.004					
Observations	6810											

Standardised beta coefficients; Standard errors in parentheses.
* p<0.10 ** p<0.05 *** p<0.01

Table 2.13 Determinants of financial assets/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – rural

Statistic	Panel A: financial assets/income ratios with estimated permanent income (type 1)						Panel B: financial assets/income ratios with 5-year average household income (type 2)					
	Coefficients		ME at extensive margin		ME at intensive margin		Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	-2.905	(2.147)					-0.002	(1.523)				
Income expectation (= no change)	0.030	(0.050)	0.005	(0.009)	0.013	(0.022)	0.007	(0.054)	0.001	(0.009)	0.003	(0.024)
Income expectation (= decrease)	0.260***	(0.077)	0.043***	(0.015)	0.114***	(0.034)	0.249***	(0.077)	0.041***	(0.015)	0.109***	(0.034)
Household permanent income (log)	0.439*	(0.228)	0.072**	(0.030)	0.192**	(0.095)	0.130	(0.181)	0.021	(0.032)	0.057	(0.080)
Female household head (1 if yes)	-0.041	(0.074)	-0.007	(0.012)	-0.018	(0.032)	0.017	(0.061)	0.003	(0.010)	0.007	(0.027)
Total household income 25-50th percentile	-0.494***	(0.112)	-0.082***	(0.008)	-0.216***	(0.042)	-0.546***	(0.103)	-0.089***	(0.015)	-0.238***	(0.041)
Total household income 50-75th percentile	-0.509***	(0.125)	-0.084***	(0.009)	-0.223***	(0.048)	-0.590***	(0.134)	-0.096***	(0.022)	-0.257***	(0.056)
Total household income 75-100th percentile	-0.607***	(0.157)	-0.100***	(0.012)	-0.266***	(0.060)	-0.733***	(0.187)	-0.119***	(0.033)	-0.320***	(0.080)
Household head aged 18-30	0.090	(0.148)	0.015	(0.023)	0.040	(0.064)	-0.140*	(0.084)	-0.023	(0.015)	-0.061*	(0.037)
Household head aged 30-40	0.050	(0.131)	0.008	(0.020)	0.022	(0.057)	-0.071	(0.104)	-0.012	(0.018)	-0.031	(0.046)
Household head aged 40-50	-0.105	(0.080)	-0.017	(0.015)	-0.046	(0.036)	-0.144*	(0.077)	-0.023	(0.015)	-0.063*	(0.035)
Household head aged 50-60	-0.100	(0.069)	-0.017	(0.012)	-0.044	(0.030)	-0.100	(0.072)	-0.016	(0.012)	-0.044	(0.031)
Household size	-0.052**	(0.023)	-0.009**	(0.004)	-0.023**	(0.010)	-0.058**	(0.024)	-0.010**	(0.004)	-0.026**	(0.010)
Marital status of household head	0.120	(0.164)	0.020	(0.028)	0.053	(0.072)	0.140	(0.162)	0.023	(0.027)	0.061	(0.071)
Minor ethnicity of household head (1 if yes)	-0.180	(0.170)	-0.030	(0.025)	-0.079	(0.072)	-0.125	(0.165)	-0.020	(0.025)	-0.055	(0.071)
No. of household members employed	0.036	(0.029)	0.006	(0.004)	0.016	(0.012)	0.039	(0.030)	0.006	(0.004)	0.017	(0.013)
Any household members with bad health	-0.007	(0.103)	-0.001	(0.017)	-0.003	(0.045)	-0.006	(0.104)	-0.001	(0.017)	-0.003	(0.045)
Highest education attainment (years)	0.036**	(0.016)	0.006***	(0.002)	0.016**	(0.007)	0.034*	(0.018)	0.006***	(0.002)	0.015**	(0.007)
Provincial fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Pseudo R squared	0.023						0.024					
Observations	9147						8887					

Standardised beta coefficients; Standard errors in parentheses.
* p<0.10 ** p<0.05 *** p<0.01

Table 2.14 Determinants of financial assets/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – migrant

Statistic	Financial assets/income ratios with estimated permanent income (type 1)					
	Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	-13.880***	(3.212)				
Income expectation (= no change)	-0.349***	(0.127)	-0.054***	(0.015)	-0.155***	(0.054)
Income expectation (= decrease)	-0.188	(0.147)	-0.029	(0.021)	-0.084	(0.064)
Household permanent income (log)	1.734***	(0.387)	0.270***	(0.039)	0.771***	(0.156)
Female household head (1 if yes)	-0.281***	(0.106)	-0.044***	(0.015)	-0.125***	(0.045)
Total household income 25-50th percentile	-0.253	(0.216)	-0.039	(0.032)	-0.112	(0.095)
Total household income 50-75th percentile	-0.245	(0.243)	-0.038	(0.035)	-0.109	(0.106)
Total household income 75-100th percentile	0.110	(0.304)	0.017	(0.049)	0.049	(0.136)
Household head aged 18-30	-1.184***	(0.396)	-0.184***	(0.056)	-0.526***	(0.171)
Household head aged 30-40	-1.242***	(0.420)	-0.194***	(0.057)	-0.552***	(0.180)
Household head aged 40-50	-0.879**	(0.393)	-0.137**	(0.064)	-0.390**	(0.175)
Household head aged 50-60	-1.082***	(0.395)	-0.169***	(0.059)	-0.481***	(0.172)
Household size	0.078	(0.070)	0.012	(0.010)	0.035	(0.031)
Marital status of household head	0.123	(0.168)	0.019	(0.025)	0.055	(0.074)
Minor ethnicity of household head (1 if yes)	-0.433***	(0.132)	-0.067***	(0.019)	-0.192***	(0.057)
No. of household members employed	-0.138	(0.125)	-0.022	(0.018)	-0.061	(0.055)
Any household members with bad health	-0.363**	(0.173)	-0.057**	(0.024)	-0.161**	(0.075)
Highest education attainment (years)	0.039	(0.038)	0.006	(0.006)	0.017	(0.017)
Provincial fixed effects	Yes		Yes		Yes	
Pseudo R squared	0.021					
Observations	1913					

Standardised beta coefficients; Standard errors in parentheses.

* p<0.10 ** p<0.05 *** p<0.01

First, look at the average marginal effects for income expectations. In Table 2.12, among all average marginal effects for income expectations, only the marginal effect at the extensive margin for the income expectation dummy indicating neutral households is statistically significant. The extensive marginal effect of this income expectation in the model with the type 1 permanent income is -0.012, implying that neutral urban households have a 1.2% lower probability of holding any financial assets. In Table 2.13, from the average marginal effects shown in Panel A, the empirical results imply that pessimistic rural households have a 4.3% higher probability of holding any financial assets and hold higher amounts of financial assets accounting for 11.4% of total household income conditional having positive financial assets, compared with optimistic and neutral households. In Panel B of Table 2.13, the estimated average marginal effects indicate that pessimistic rural households have a 4.1% higher probability of holding any financial assets and hold higher amounts of financial assets accounting for 10.9% of total household income conditional having positive financial assets, compared with optimistic and neutral households.

In contrast, in Table 2.14, the average marginal effects of the income expectation variable identifying neutral migrant households are statistically significant at 1% significance level, but the average marginal effects of the income expectation variable identifying pessimistic migrant households are statistically insignificant. In detail, neutral migrant households have a 5.4% lower probability of holding any financial assets and hold lower amounts of financial assets accounting for 15.5% of total household income conditional having positive financial assets, compared with optimistic and pessimistic households.

Turning to household permanent income, the estimated average marginal effects for urban households are displayed in Table 2.12. In Panel A, the estimated average marginal effects of household permanent income are not significant. In Panel B, the estimated average marginal effects of household permanent income are positive and statistically significant at 1% significance level. The estimated average marginal effect of permanent income on the probability of whether urban households have any financial asset at the extensive margin is 0.099, implying an almost 10% contribution to the unconditional

likelihood of having any financial assets, with an additional 1% increase in the household permanent income. The estimated intensive marginal effect of permanent income in the asset-to-income ratio is 0.504, indicating that, conditional on having positive financial assets, a 1% increase in permanent income leads to approximately an increase in the amounts of financial assets held by urban households, accounting 50.4% of total household income. Therefore, permanent income determines household financial assets in both ways: changing the likelihood of households participating in household financial activities and influencing the outstanding percentage of financial assets over household income.

When it comes to rural households, the relationship between the household permanent income and the target asset-to-income variables is similar to that of urban households, as shown in Table 2.13. In Panel A, the estimated extensive marginal effect for type 1 permanent income is 0.072 at 5% significance level, implying that a 1% increase in the permanent income directly contributes to an increase of 7.2% in the likelihood of holding financial assets for rural households. The average marginal effect at the intensive margin shows, conditional on the holdings of financial assets, a 1% increase of permanent income approximately incurs a 19.2% increase in the share of household assets on income. In contrast, both the extensive marginal effect and the intensive marginal effect of type 2 permanent income are not statistically significant, indicating that no relationship is found between the type 2 permanent income (the arithmetic mean of the realised income data) and relative household holdings of financial assets with respect total household income.

Apart from permanent income and income expectations, income position is another important determinant. All households are divided into four groups, and four income quartile dummies are created to represent households in different income quartiles. The lowest income quartile is omitted in the regressions as the reference category. The other three dummies represent households in the second lowest income quartile, the second highest income quartile, and the highest income quartile, respectively. From the estimation results shown in Table 2.12 (urban), moving from a lower income position to a relatively higher income position generally increases the marginal effects both at the extensive and intensive margins. The estimation results suggest that urban households in relatively

higher income positions are more likely to hold financial assets and, conditional on having assets, hold higher ratios of household assets over household income. The opposite is found for rural households (see Table 2.13). As for migrant households shown in Table 2.14, the estimated results for all income dummies are not significant, indicating there is no obvious difference between households in different income quartiles.[23]

2.4.5 Regression results for household financial debt

Identical to the discussion of the determinants of household financial assets in Section 2.4.4, this section mainly focuses on the average marginal effects at the extensive and intensive margins of income expectations, permanent income, and household income quartile variables for urban, rural and migrant households, respectively. The extensive marginal effects indicate the impacts on the probability of being indebted, while the intensive marginal effects suggest the impacts on the amount of household debt conditional on having positive household debt. Here, the dependent variables are the debt-to-income ratios. Therefore, in more detail, the average marginal effect at the intensive margin reveals the impact on the amount of household debt as a percentage of total household income. The results of urban, rural and migrant households are shown in Table 2.15, Table 2.16 and Table 2.17, respectively.

Looking at Panel A of Table 2.15, among the average marginal effects of income expectations and household permanent income, only the average marginal effects of the income expectation variable representing pessimistic urban households are statistically significant at 10% significance level. The empirical results imply that pessimistic rural households have a 1.6% higher probability of being indebted (the extensive average marginal effect of 0.016) and hold higher amounts of financial assets accounting for 7.1% of total household income conditional having positive financial assets (the extensive average marginal effect of 0.071), compared with optimistic and neutral households. In Panel

[23] Comments on the heterogenous impacts are made in the next section, Section 2.4.4.

B of Table 2.15, the average marginal effects at the extensive and intensive margins are not significant, while the average marginal effects of type 2 permanent income are significant at 1% significant level. The marginal effect at the extensive margin is -0.054, indicating that a 1% increase in type 2 permanent income is associated with a 5.4% lower probability of being indebted. The marginal effect at the intensive margin is -0.234, indicating that a 1% increase in type 2 permanent income is related to a decrease in the amount of household debt, accounting for 23.4% of total household income.

The estimated results for rural households are shown in Table 2.16. As shown in Table 2.16, the coefficients and average marginal effects of both income expectation variables are not statistically significant, indicating that there is no significant correlation between income expectations and household debt both in the probability of holdings and the amounts conditional on being indebted. In both panels (Panel A and Panel B), the coefficients of type 1 permanent income and type 2 permanent income are negative and statistically significant at 1% or 5% significance level. In Panel A of Table 2.16, the estimated marginal effect at the extensive margin for type 1 permanent income is -0.050 at 5% significance level, implying that a 1% increase in the permanent income is related to a 5% decrease in the likelihood of being indebted for rural households. The average marginal effect at the intensive margin being -0.112 shows, conditional on being indebted, a 1% increase of type 1 permanent income approximately incurs a decrease of the amount of household debt amounting to 11.2% of total household income.

In Panel B of Table 2.16, the estimated marginal effect at the extensive margin for type 2 permanent income is -0.071 at 1% significance level, implying that a 1% increase in the permanent income is related to a 7.1% decrease in the likelihood of being indebted for rural households. The average marginal effect at the intensive margin, which is -0.160, indicates that a 1% increase of the type 1 permanent income approximately incurs a decrease in the amount of household debt, amounting to 16% of total household income conditional on being indebted.

Table 2.15 Determinants of financial debt/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – urban

Statistic	Panel A: financial debt/income ratios with estimated permanent income (type 1)						Panel B: financial debt/income ratios with 5-year average household income (type 2)					
	Coefficients		ME at extensive margin		ME at intensive margin		Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	-6.959***	(2.428)					2.552	(3.902)				
Income expectation (= no change)	-0.314	(0.230)	-0.013	(0.009)	-0.058	(0.042)	-0.310	(0.230)	-0.013	(0.009)	-0.057	(0.042)
Income expectation (= decrease)	0.385*	(0.231)	0.016*	(0.010)	0.071*	(0.043)	0.371	(0.230)	0.016	(0.010)	0.068	(0.042)
Household permanent income (log)	-0.207	(0.131)	-0.009	(0.006)	-0.038	(0.024)	-1.265***	(0.437)	-0.054***	(0.019)	-0.234***	(0.080)
Female household head (1 if yes)	-0.119	(0.221)	-0.005	(0.009)	-0.022	(0.041)	-0.140	(0.221)	-0.006	(0.009)	-0.026	(0.041)
Total household income 25-50th percentile	-1.375***	(0.350)	-0.058***	(0.011)	-0.254***	(0.063)	-0.855**	(0.344)	-0.036***	(0.012)	-0.158**	(0.063)
Total household income 50-75th percentile	-1.233***	(0.326)	-0.052***	(0.012)	-0.228***	(0.059)	-0.348	(0.387)	-0.015	(0.016)	-0.064	(0.071)
Total household income 75-100th percentile	-1.034***	(0.292)	-0.044***	(0.016)	-0.191***	(0.054)	0.338	(0.524)	0.014	(0.022)	0.062	(0.097)
Household head aged 18-30	1.824**	(0.806)	0.077***	(0.029)	0.337**	(0.147)	1.919**	(0.771)	0.081***	(0.027)	0.355**	(0.140)
Household head aged 30-40	1.630***	(0.548)	0.069***	(0.016)	0.301***	(0.099)	1.658***	(0.526)	0.070***	(0.015)	0.306***	(0.095)
Household head aged 40-50	1.438***	(0.491)	0.061***	(0.014)	0.266***	(0.088)	1.368***	(0.484)	0.058***	(0.014)	0.253***	(0.087)
Household head aged 50-60	1.454***	(0.559)	0.062***	(0.015)	0.269***	(0.101)	1.361**	(0.554)	0.058***	(0.015)	0.251**	(0.100)
Household size	0.049	(0.122)	0.002	(0.005)	0.009	(0.023)	0.087	(0.121)	0.004	(0.005)	0.016	(0.022)
Marital status of household head	0.293	(0.426)	0.012	(0.018)	0.054	(0.079)	0.346	(0.427)	0.015	(0.018)	0.064	(0.079)
Minor ethnicity of household head (1 if yes)	1.161**	(0.469)	0.049***	(0.017)	0.215**	(0.085)	1.165**	(0.469)	0.049***	(0.017)	0.215**	(0.085)
No. of household members employed	0.292**	(0.149)	0.012*	(0.007)	0.054**	(0.027)	0.271*	(0.139)	0.012*	(0.006)	0.050*	(0.026)
Any household members with bad health	1.213***	(0.321)	0.051***	(0.011)	0.224***	(0.058)	1.195***	(0.317)	0.051***	(0.011)	0.221***	(0.057)
Highest education attainment (years)	0.087**	(0.041)	0.004**	(0.001)	0.016**	(0.007)	0.106**	(0.043)	0.005***	(0.001)	0.020**	(0.008)
Provincial fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Pseudo R squared	0.020						0.022					
Observations	6810											

Standardised beta coefficients; Standard errors in parentheses

* p<0.10 ** p<0.05 *** p<0.01

Table 2.16 Determinants of financial debt/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – rural

Statistic	Financial debt/income ratios with estimated permanent income (type 1)						Financial debt/income ratios with 5-year average household income (type 2)					
	Coefficients		ME at extensive margin		ME at intensive margin		Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	-10.790***	(2.626)					-9.357***	(1.755)				
Income expectation (= no change)	-0.113	(0.105)	-0.010	(0.009)	-0.023	(0.021)	-0.128	(0.107)	-0.012	(0.010)	-0.026	(0.022)
Income expectation (= decrease)	-0.204	(0.191)	-0.019	(0.017)	-0.042	(0.039)	-0.174	(0.190)	-0.016	(0.017)	-0.036	(0.039)
Household permanent income (log)	-0.550**	(0.273)	-0.050**	(0.024)	-0.112**	(0.055)	-0.783***	(0.266)	-0.071***	(0.020)	-0.160***	(0.054)
Female household head (1 if yes)	-0.070	(0.223)	-0.006	(0.020)	-0.014	(0.045)	-0.129	(0.225)	-0.012	(0.020)	-0.026	(0.046)
Total household income 25-50th percentile	-0.758***	(0.141)	-0.069***	(0.009)	-0.154***	(0.028)	-0.441***	(0.133)	-0.040***	(0.012)	-0.090***	(0.027)
Total household income 50-75th percentile	-1.025***	(0.171)	-0.093***	(0.010)	-0.209***	(0.034)	-0.483***	(0.177)	-0.044***	(0.017)	-0.099***	(0.036)
Total household income 75-100th percentile	-1.286***	(0.201)	-0.117***	(0.011)	-0.262***	(0.040)	-0.448*	(0.258)	-0.041*	(0.024)	-0.091*	(0.053)
Household head aged 30-40	0.387**	(0.165)	0.035**	(0.014)	0.079**	(0.033)	0.496***	(0.164)	0.045***	(0.013)	0.101***	(0.033)
Household head aged 40-50	0.649***	(0.151)	0.059***	(0.012)	0.132***	(0.030)	0.635***	(0.153)	0.058***	(0.013)	0.130***	(0.031)
Household head aged 50-60	0.366***	(0.136)	0.033***	(0.012)	0.074***	(0.027)	0.318**	(0.136)	0.029**	(0.012)	0.065**	(0.028)
Household size	0.118***	(0.041)	0.011***	(0.003)	0.024***	(0.008)	0.146***	(0.045)	0.013***	(0.003)	0.030***	(0.009)
Minor ethnicity of household head (1 if yes)	-0.732***	(0.170)	-0.067***	(0.013)	-0.149***	(0.034)	-0.729***	(0.171)	-0.066***	(0.013)	-0.149***	(0.034)
No. of household members employed	-0.029	(0.039)	-0.003	(0.004)	-0.006	(0.008)	-0.010	(0.040)	-0.001	(0.004)	-0.002	(0.008)
Any household members with bad health	0.489***	(0.103)	0.045***	(0.009)	0.100***	(0.021)	0.458***	(0.105)	0.042***	(0.010)	0.094***	(0.021)
Highest education attainment (years)	0.041**	(0.019)	0.004**	(0.002)	0.008**	(0.004)	0.048**	(0.020)	0.004**	(0.002)	0.010**	(0.004)
Provincial fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Pseudo R squared	0.062						0.064					
Observations	9147						8887					

Standardised beta coefficients; Standard errors in parentheses.

* p<0.10 ** p<0.05 *** p<0.01

Note: The variable indicating households with a head aged 18-30 is omitted in the debt estimation for rural households, because the inclusion with all dependent variables induces no results of average marginal effects reported by Stata and deleting one age dummy can solve this problem.

Table 2.17 Determinants of financial debt/income with average marginal effects (ME) at both the extensive margin and the intensive margin (Tobit) – migrant

Statistic	Financial debt/income ratios with estimated permanent income (type 1)					
	Coefficients		ME at extensive margin		ME at intensive margin	
Intercept	-12.890*	(6.720)				
Income expectation (= no change)	-0.213	(0.298)	-0.013	(0.017)	-0.040	(0.055)
Income expectation (= decrease)	0.298	(0.338)	0.018	(0.021)	0.055	(0.063)
Household permanent income (log)	0.645	(0.694)	0.039	(0.040)	0.120	(0.128)
Female household head (1 if yes)	-0.373	(0.351)	-0.023	(0.020)	-0.069	(0.065)
Total household income 25-50th percentile	-0.658**	(0.328)	-0.040*	(0.021)	-0.122**	(0.061)
Total household income 50-75th percentile	-0.856**	(0.340)	-0.052***	(0.020)	-0.158**	(0.063)
Total household income 75-100th percentile	-1.201***	(0.457)	-0.073***	(0.024)	-0.222***	(0.084)
Household head aged 18-30	0.981	(0.831)	0.060	(0.051)	0.182	(0.154)
Household head aged 30-40	0.124	(0.872)	0.008	(0.053)	0.023	(0.161)
Household head aged 40-50	0.819	(0.912)	0.050	(0.054)	0.152	(0.169)
Household head aged 50-60	1.460*	(0.884)	0.089*	(0.054)	0.271*	(0.164)
Household size	0.470***	(0.138)	0.029***	(0.008)	0.087***	(0.025)
Marital status of household head	0.735	(0.512)	0.045	(0.030)	0.136	(0.095)
Minor ethnicity of household head (1 if yes)	-0.225	(0.368)	-0.014	(0.022)	-0.042	(0.068)
No. of household members employed	-0.096	(0.207)	-0.006	(0.013)	-0.018	(0.038)
Any household members with bad health	2.017***	(0.483)	0.123***	(0.023)	0.374***	(0.088)
Highest education attainment (years)	-0.032	(0.053)	-0.002	(0.003)	-0.006	(0.010)
Provincial fixed effects	Yes		Yes		Yes	
Pseudo R squared	0.038					
Observations	1913					

Standardised beta coefficients; Standard errors in parentheses

* p<0.10 ** p<0.05 *** p<0.01

In Table 2.17, the coefficients of income expectation variables and the type 1 permanent income are not significant for migrant households. The lack of statistical significance in the coefficients indicates that there are no differences in the probability of being indebted and the amount of household debt conditional on having positive household debt between migrant households with different income expectations. Similarly, the average marginal effects of type 1 permanent income being statistically insignificant indicate that there is no impact of household permanent income on the probability of being indebted and the amount of household debt conditional on having positive household debt.

Furthermore, look at the debt behaviours for households in different income quartiles. In Panel A of Table 2.15 for urban households, the average marginal effects at the extensive margins for the second lowest income quartile, the second highest income quartile and the highest income quartile are -0.058, -0.052, and -0.044 respectively, which are statistically significant at 1% significance level. Comparing the magnitude of three extensive marginal effects, urban households in the second lowest income quartile have the lowest probability of being indebted. In Panel B of Table 2.15, only the average marginal effect at the extensive margin for the second lowest income quartile is significant, which is -0.036 and statistically significant at 1% significance level. This indicates that, compared with households in other income quartiles, urban households in the second lowest income quartile have the lowest probability of being indebted.

In Table 2.16 for rural households, all coefficients and average marginal effects are negative and statistically significant at 1% or 10% significance level. In Panel A, the average marginal effects at the extensive margins for the second lowest income quartile, the second highest income quartile and the highest income quartile are -0.069, -0.093, and -0.117 respectively. Comparing the magnitude of three extensive marginal effects, urban households in the highest income quartile have the lowest probability of being indebted. In Panel B, the average marginal effects at the extensive margins for the second lowest income quartile, the second highest income quartile and the highest income quartile are -0.040, -0.044, and -0.041 respectively. Comparing the magnitude of three extensive marginal effects, urban

households in the second highest income quartile have the lowest probability of being indebted, even if the intensive marginal effects are close in magnitude.

In Table 2.17 for migrant households, looking at the average marginal effects at the extensive and intensive margins, they are all statistically significant at 1%, 5%, or 10% significance level. The average marginal effects at the extensive margins for the second lowest income quartile, the second highest income quartile and the highest income quartile are -0.040, -0.052, and -0.073 respectively. Comparing the magnitude of these three extensive marginal effects, urban households in the highest income quartile have the lowest probability of being indebted, compared with households in the second highest, the second lowest, and the lowest (the reference group) income quartiles. This finding is consistent with that of urban households.

The empirical results show no conclusive evidence to indicate significant differences across distinct income expectation groups. This outcome implies that households tend to maintain their levels of household debt as a portion of total income, even after considering prospective changes regarding future income. This empirical finding deviates from earlier findings based on other Asian developing countries. For example, using the subjective probabilistic income expectations, Klühs *et al.* (2019) find that higher income expectations are likely to stimulate or encourage greater engagement in household borrowing activities, thus leading to the over-indebtedness of Thailand households.

Even if the models and variables used for urban, rural and migrant households are consistent, the results are still not comparable to some extent. In all models, this chapter uses ratios with respect to total household income as the dependent variables. The income information used is kind of cash income. Nevertheless, for rural households, there are two primary income resources, cash income and the equivalent income from homemade products (e.g., agricultural products) for their consumption (Shi and Chuliang, 2010), which lead to the differences in the measurement of consumption and income for rural households. Therefore, this chapter focuses on revealing some stylised facts to show the relationship

between predictors and household financial and consumption decisions instead of making comparisons between groups or getting causal relationships.

2.5 Conclusion and Discussion

This chapter contributes to the existing research in studying household financial and consumption behaviours by controlling income expectations and two types of permanent income measures using a popular nationwide survey including complete information on all three types of households – urban, rural, and migrant households. The division method of Chinese residents is attributed to the unique household registration system called hukou, aimed at restricting residents' mobility by assigning urban or rural hukou types to different households. This data source provides a good opportunity to build a preliminary understanding of the behaviours and decisions of rural and migrant households and add new evidence for the role of income expectations on the decisions of urban households.

This chapter mainly explores the role of household income expectations, which reveal people's subjective opinions about the changes in future income. The financial expectations show a "positive response pattern" with most respondents expecting a higher income level based on the data from the 2002 Chinese Household Income Project. This finding is not in accordance with the neutral response pattern found in Brown *et al.*, (2023). The difference in distribution is not surprising due to different socioeconomic backgrounds and macroeconomic environments. When China experienced an extremely high growth rate, as discussed in the institutional background section, it was common for most individuals to believe that their income would increase in the future; however, whether income expectations determine household decisions is ambiguous. Thus, this study sheds some light on the role of income expectations on households' consumption and financial decisions after constructing household permanent income variables as the covariate.

Empirical results suggest that income expectations differ in determining household financial and consumption decisions for each group. For urban households, neutral urban households expecting no changes in future income have a lower probability of having any financial assets. They also have higher amounts of consumption (total, durable and nondurable) as a proportion of household income than optimistic households expecting higher future income. Pessimistic urban households, on average, have a higher probability of being indebted and have higher debt ratios with respect to household income conditional on being uncensored than optimistic households. They also have higher amounts of consumption (total, durable and nondurable) as a proportion of household income compared with optimistic households. In summary, neutral urban households are less likely to participate in financial markets, and pessimistic households are more likely to be indebted. Compared with these two groups, optimistic urban households spend a smaller fraction of their household income to satisfy their consumption. Income expectations have impacts on the willingness of having financial activities and influence household burdens on meeting consumption demands.

For rural households, only a correlation between income expectations and household assets is found. In detail, pessimistic households in rural areas have a higher likelihood of having household financial assets and have higher amounts of financial assets conditional on having any financial assets. Lastly, for migrant households, neutral households have a lower probability of having any financial assets and then hold lower financial assets with respect to annual household income conditional on being uncensored, compared with optimistic households. Besides, pessimistic migrant households have smaller consumption-to-income ratios, indicating that a smaller proportion of annual household income is spent on consumption (durable and nondurable).

The results reveal significant disparities among three subgroups: urban, rural, and migrant households. These differences likely stem from the inherent characteristics of each group. Urban households have better resources and receive support from authorities reflected in many aspects including education, employment, medical care, etc, while rural households mainly rely on local communities. The rural-to-urban migrants live and work in the urban, but they don’t have any access to the benefits of urban

households. However, the simple separation of migrant households and their extended families in the rural areas is an endeavour. For example, this chapter neglects the role of remittance between migrant households and their extended families due to the limitations of data. If alternative data sources permit, it could be beneficial to explore factors that reflect the link between migrant households and their extended families, such as the geographical distance and the remittances between them.

In conclusion, the role of income expectations is different for urban, rural and migrant households. Supposing policymakers want to influence household income expectations, thus changing household financial and consumption behaviours, they should be aware that there is no one-size-fits-all approach to achieve policy goals. At least, they should figure out the heterogenous effects of income expectations on different groups. This chapter attempts to build a relationship between income expectations, but it is admittedly unable to clarify the influencing mechanism of income expectations. To figure out the causal estimates of income expectations on household financial and consumption outcomes, methods like instrumental variable approaches are worth attempting if relevant microdata are available. For example, Frijters *et al.* (2012) use regional financial prospects and past income changes as instrumental variables to solve the endogeneity problem. Future research is worthwhile.

This chapter only uses household subjective income expectations, but there are many more angles that are worth consideration. For example, household income expectations reflect household subjective perception of income changes in the future, but they are unable to capture peoples' subjective judgement about future income risks, which can be measured by subjective income variances. Future research, if possible, can control the expectations about income changes and income variances at the same time to get more accurate results. Moreover, limited by the availability of financial expectation data, this chapter uses cross-sectional data and thus cannot control for panel effects and the formation processes of income expectations. Therefore, the empirical findings can be inspected and replenished from various perspectives.

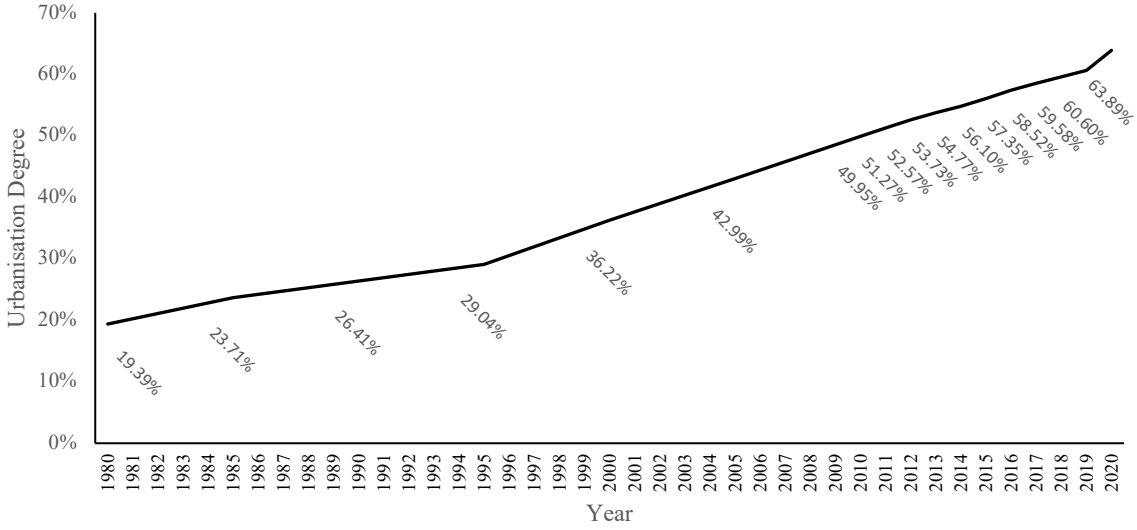
Chapter 3

The Impact of Housing Demolitions on Household Financial and Consumption Decisions: Evidence from China

3.1 Introduction

The degree of urbanisation in China has increased monotonically over the past four decades (see Figure 3.1), measured by the ratio of the urban population to the total Chinese population. The proportion rose from less than 20% in 1980 to 63.89% in 2020. From the seventh national census, more than 0.9 billion people lived in an urban area in 2020, and the urban population increased by 0.24 billion over the past ten years (National Bureau of Statistics of China, 2021a). Specifically, the urban population grew from 699.27 million in 2011 to 914.25 million in 2022, while the rural population decreased from 649.89 million to 498.35 million (National Bureau of Statistics of China, 2022b). The consecutive rapid growth of the urban population leads to the development and boom of the real estate market, and further causes large-scale housing demolitions in the urban areas, also called urban renewal, to meet the huge demand for land and dwellings (Li and Xiao, 2020).

Figure 3.1 The Degree of urbanisation in China



Source: National Bureau of Statistics of China (National Bureau of Statistics of China, 2021b)

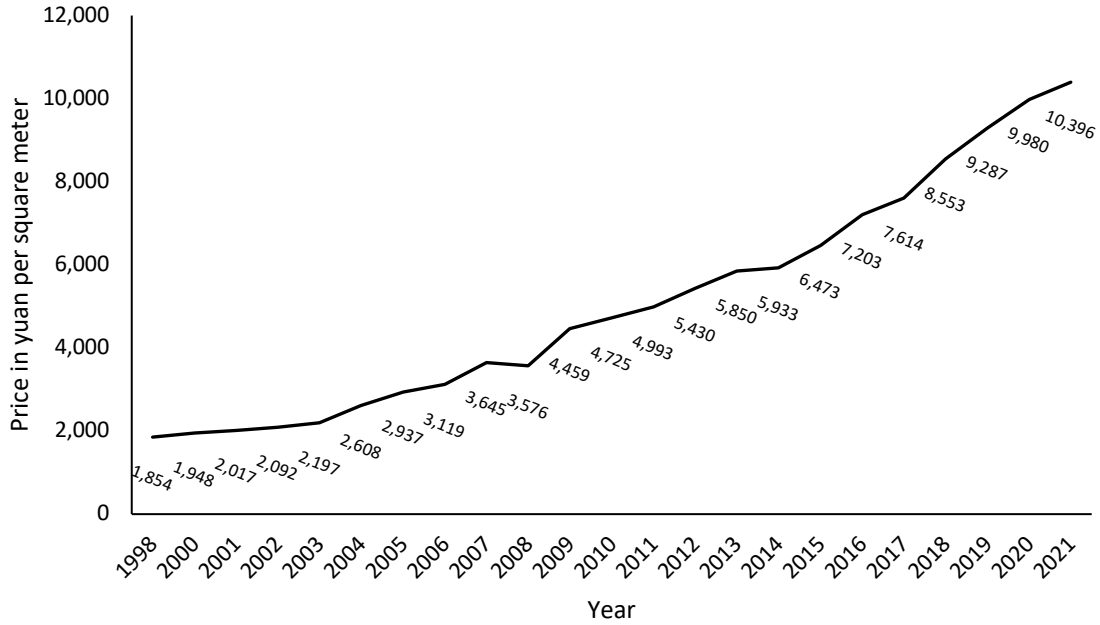
Note: The degree of urbanisation is defined as the ratio of citizens living in urban areas to the total population.

Housing demolitions are a central topic in the processes of Chinese urbanisation. On one side, there are some prevalent folk expressions describing the phenomena that households become wealthy after experiencing housing demolitions, like *Chai Er Dai* (the rich generation due to housing demolitions) and *Chai Qian Fu* (the rich demolished households). On the other side, multifaceted housing demolitions are inevitably among the most contentious issues, which potentially lead to prominent social problems, including violent demolitions and nail households (*Ding Zi Hu*) in the practices. The purpose of studying housing demolitions is to clarify existing problems in the process of urbanisation, to understand the impacts on affected households, and to provide suggestions for subsequent practices.

The large-scale housing demolitions, along with the rapid urban expansion, are a noteworthy phenomenon in post-reform China. The percentage of households ever experiencing housing demolition was approximately 10% in 2013 and increased to around 16% in 2019, calculated based on the biennial China Household Finance Survey data (Shi and He, 2022). According to the Chinese Household Income Project (CHIP), 4.6% of rural households and 13.3% of urban households ever experienced housing demolition in China by the year of 2013 (Wang *et al.*, 2023; Zhao and Liu, 2022).

The past two decades have witnessed the rapid growth of household housing values in China, along with the development of Chinese housing markets (Zou and Deng, 2019). After the housing reform in the year of 1998, the average sale price of residential housing properties in China increased from 1,854 yuan (the principal unit of Chinese currency) per square meter in 1998 to 10.396 yuan per square meter in 2021 (Figure 3.2). As shown in Figure 3.2, the price of Chinese residential real estate maintained steady growth after the reform, except for the year of 2008 when the global financial crisis happened following the US subprime mortgage crisis.

Figure 3.2 Average real estate sale prices of residential real estate in China between 1998 and 2021(in yuan per square meter)



Source: National Bureau of Statistics of China (National Bureau of Statistics of China, 2022a)

Chaiqian (demolitions and relocations) in Chinese consists of two Chinese characteristics – *Chai* (housing demolitions) and *Qian* (housing relocations). Old housing properties are demolished, and the residents (both renters and owners) are forced to move to new housing properties. In this chapter, housing demolition is used to describe the processes of housing seizure, demolition and relocation, though other terms are used in other papers, such as eminent domain, compulsory house takings and state expropriation (e.g. Sha and Zou, 2022). From the perspective of households, demolitions lead to a change in household wealth endowments. This is likely to influence economic decisions, such as financial decisions on assets and debt and consumption decisions, of relocated households. Whether and how demolitions determine household decisions are therefore of interest in studying household financial and consumptive behaviours, both from an academic and policy perspective. Previously due to the scarcity of nationwide data on housing demolitions at the household level, limited empirical studies have been completed to study these issues in China.

In the past ten years, a few randomized household surveys, such as the China Family Panel Studies (CFPS)[24] and the China Household Finance Survey (CHFS), began to collect housing demolition information via nationwide surveys. Both nationally representative surveys are conducted every two years, with the CFPS starting in 2010 and the CHFS starting in 2011. The former (CFPS) asked respondents whether their family had experienced housing demolition in the past 12 months since the 2014 wave of the CFPS. This question is designed to capture housing demolition information considering an interval of one year before the survey time. The answers to the demolition question in the CFPS can be used to explore the short-term impacts within a one-year time horizon based on cross-sectional data; however, when multiple waves are combined, there is insufficient information to determine all households affected by housing demolition in the biennial surveys. By comparison, the CHFS provides more comprehensive information on housing demolitions that can be used to identify all affected households between two waves. For this reason, this chapter uses the CHFS to study the effects of housing demolitions to fill the empirical gap.

Large-scale housing demolitions are usually involuntary, with the participation of local authorities for many reasons, such as boosting local economic growth and increasing government budgets, leading to reasonable compensations in most cases (Goetz, 2013; Kearns and Mason, 2013; Huang *et al.*, 2020). Housing demolitions are usually exogenously regulated and determined by local authorities, and therefore housing demolition compensation can be treated as an external shock (Shi and He, 2022). The exogenous housing demolitions can be used to create a quasi-natural experiment with affected households experiencing housing demolition being the treatment group and unaffected households being the control group. This innovative method facilitates the identification of the impacts of housing demolition by comparing the difference between the two groups. Due to the housing appreciation in a short period of time in China, housing demolition compensation potentially has a greater wealth shock to affected households (Shi and He, 2022).

[24] The China Family Panel Studies (CFPS) programme is funded by Peking University and conducted by the Institute of Social Science Survey of Peking University.

Following the empirical methods used in Zhou (2018), this chapter employs a difference-in-difference (DD) strategy to avoid the potential for endogeneity and selection problems, thus capturing the causal impact of demolitions on household finances and consumption decisions. Using data from the CHFS, this chapter selects whether respondent households ever experienced housing demolitions to form the treatment group and other households as the control group, based on whether the respondent household ever experienced housing demolition. The housing demolitions are regarded as an external shock to the households in the treatment group. This chapter compares several financial outcomes, assets and debt – thus considering both sides of the household balance sheet, as well as decisions about consumption at the household level before and after the demolition treatment between households that ever experienced housing demolitions and those never experiencing housing demolitions, to uncover the causal impact of housing demolitions.

This chapter contributes to the existing literature from three perspectives. First, this chapter constructs balanced panel data based on two waves of the CHFS (the 2013 wave and the 2017 wave), overcoming the restrictions of microdata used by this chapter due to the inconsistency and discontinuity of the survey questions regarding housing demolitions across the five waves (2011, 2013, 2015, 2017 and 2019). Second, this chapter posits that housing demolitions are external wealth shocks for households following the existing literature and uses the longitudinal difference-in-difference method as the exogenous identification strategy to explore the impacts of housing demolitions on household decisions. Third, this chapter provides empirical evidence on a broader set of household decisions, including household financial asset allocation, debt, and consumption decisions.

There are two basic classical theories that can be used to support the effects of wealth shocks on consumption: the permanent income hypothesis proposed by Friedman (1957) about the consumption behaviours toward permanent shocks; and the life cycle hypothesis by Ando and Modigliani (1963) about the consumption smoothing over time.

Based on the permanent income hypothesis proposed by Friedman (1957) and the life cycle hypothesis by Ando and Modigliani (1963), wealth shocks from housing demolitions change the permanent income and lead to the consumption smoothing over the life cycle. In detail, the following hypotheses are formulated:

H1: Households adjust the financial asset allocation among various financial assets and hold more risky assets after housing demolitions.

H2: Affected households decrease their holdings of different debt categories because housing demolitions release their debt burden.

H3: The ratios of different consumption categories over household income decrease when households have more financial resources to meet consumption demands after the wealth shocks from housing demolitions.

The rest of this chapter is organised as follows. Section 2 presents the literature review about housing demolitions in the context of China and the wealth effects of housing demolitions. Section 3 contains three sub-sections introducing the data, the dependent variables and the independent variables respectively. Section 4 discusses the empirical strategies and the empirical results. Section 5 concludes.

3.2 Literature Review

3.2.1 Housing demolition in China

Compared with Western countries, the debates about housing demolitions in China started relatively late. For the UK, the statutory demolitions of unsound and unwanted houses allowed by the government first appeared in the late nineteenth century, and in this century there are large-scale demolitions after the 2003 Sustainable Communities Plan (Power, 2008). Comparatively, the Chinese government first issued the regulatory decree on the demolition and removal of houses in urban areas in 1991, namely the *Urban Housing Demolition and Relocation Administrative Management Regulations*, for the demands of urban development (Liu and Xu, 2018). The 1991 version was modified and replaced with a new version in 2001; the latter underlined the interests of relocated households and the participation of residents in the negotiation of compensation and related issues.

In the new regulations, it is clearly emphasized that a housing demolition should meet the requirements of local urban planning and achieve the aims of urban renewal and environmental improvements (see http://www.gov.cn/gongbao/content/2001/content_60912.htm for the full text of the 2001 demolition decree of the state council). After the 1991 decree, there were three crucial stages for housing demolitions: (1) the 1991-2000 period during the transition from a planned to market economy; (2) the 2001-2007 period under the new market economic system; and (3) the post-2007 period with the promulgation and implementation of the property law (Tang, 2007). The property law provides legal ground for the whole country in dealing with housing demolitions, especially providing legal instruments to solve any demolition conflicts (Zhou, 2010).

Besides, Day and Cervero (2010) point out two important transition processes of Chinese housing demolitions: the first is the transition from the on-site relocation to the cancellation of such requirements in the late 1990s, and the second change is the method of demolition compensation, which was previously based on the family size of affected households (the number of household members) and are

now based on the evaluated market value of the object due to the implementation of the new regulations in housing demolitions after the year of 2001. After the cancellation of on-site relocation requirements, Guan and Xu (2018) find that local authorities prefer providing peripheral residential choices to relocated households based on evidence from survey data in China's biggest megacity Shanghai, due to the fiscal burdens of local authorities. This phenomenon also appears in other cities, i.e., Beijing (Li and Xiong, 2018; Dang *et al.*, 2014) and Guangzhou (Ren, 2020).

Another milestone for housing demolition in China is the issuance of the No. 590 order of the State Council of the People's Republic of China in 2011, namely the *Regulations for Demolition and Compensation for Houses on State-owned Land*.[25] This document requires that local authorities should offer compensation to affected households based on both the market value of houses and any losses and costs arising therefrom. The new regulations emphasise that the living standards of affected households should be improved after housing demolition, and the reference house prices for compensation should not be lower than the market prices of similar properties (Cao and Zhang, 2018; Shi and He, 2022). Therefore, there is a remarkable increase in average compensation received by affected households after the implementation of the regulations, the year of 2011 (Sha and Zou, 2022).

Housing demolitions are not simply an economic issue. First, it is also an environmental aspect that needs to be considered. For example, demolitions are closely associated with energy consumption. Evidence from the UK shows that mass demolitions are necessary to achieve the reduction targets of energy consumption with specific environmental purposes, for instance, reducing the emissions of CO_2 (Boardman *et al.*, 2005; Boardman, 2007), with the guidance of the Energy White Paper of the year 2003 (Department of Trade and Industry, 2003) authorized by the British government. In Germany, all pre-1984 units are expected to be demolished or upgraded to meet the current criteria with the purpose of reducing energy consumption by 2020 (Power, 2008).

[25] See http://www.gov.cn/zwgk/2011-01/21/content_1790111.htm for the full text of the No. 590 order of the State Council of the People's Republic of China.

The urban planning practices of the Chinese megacity, Shanghai, along with the implementation of the Transit-Oriented Development (TOD) methods, confirm that proper large-scale demolitions are effective in reducing carbon emissions (Dou *et al.*, 2016). While demolitions, as a part of urbanization, may have many advantages in protecting the environment, short-term improper urbanization also brings many adverse impacts, such as land loss and diseases (e.g. Liang and Yang, 2019). From the empirical research of several Asian countries, Irfan and Shaw (2017) reveal that the relationship between specific environment indexes and urbanization is nonlinear, and there is a conceptual threshold as a turning point to achieve the efficiency of urbanization.

Secondly, housing demolitions are a social issue. On the one side, housing demolitions contribute to the development of Chinese cities. On the other side, large-scale demolitions are accompanied by many social problems. First, mass demolitions of old houses in the past forty years inevitably led to the damage of historic buildings with rich local characteristics (Shi *et al.*, 2019), including some traditional residential houses. For example, the traditional alleyways structures and the courtyard-style housing systems of Beijing city discussed in Zacharias *et al.* (2015) and the traditional street systems and historic buildings of Shanghai city explored in Zhong and Chen (2017). Second, even if the demolition jobs are required to meet the market principles, evidence shows that large-scale demolitions sometimes violate the market-oriented requirements to some extent; and the artificial intervention leads to the mismatches and disorder of many markets, e.g., the public transportation (Dou *et al.*, 2016).

Third, in the demolition processes, forced eviction, even with violent demolitions, is an inevitable social problem in the world (du Plessis, 2005). Liu and Xu (2018) give an overview of this phenomenon, including the essential reasons, the impacts of different levels, and some solutions proposed in the existing literature. It is worth noting that the authors emphasize that, in the context of China, the primary cause of violent demolitions is when conflict arises between land ownership and the rights to use land because the land is owned by the state or collectives but used by private units.

Furthermore, the phenomenon of large-scale housing demolitions in China is accompanied by the rapid course of urbanization (He, 2014). At the macro level, high-speed urbanization enhances economic growth by attracting humans, resources and investment, based on a panel from 2006 to 2015 (Liang and Yang, 2019). This finding is consistent with the conclusion that urbanization (indexed by the percentage of the urban population) is positively associated with economic development (i.e., per capita GDP and the degree of industrialization) (see Moomaw and Shatter, 1996 for 90 countries and Henderson, 2003 for a review of existing literature). With rapid urbanization, the expansion and renewal of Chinese cities are inevitable (Cheng and Masser, 2003), and one of the most prevailing modes is massive housing demolitions (Zhong and Chen, 2017; Wu, 2004; Yu *et al.*, 2020).

Li *et al.* (2018) construct a theoretical framework, on Chinese forced relocation in urban areas, to conceptualize the demolition processes by dividing the whole course into three stages: the first stage is the pre-demolition stage of being informed of the top-down decision and reaching the compensation agreement; the second stage is the transitional stage, different from other countries (i.e., European countries and the US), in which households live in a temporary dwelling; and the third is the final stage of moving into new houses. Generally, the institutional arrangements of housing demolition have two directions (the top-down mode and the down-top mode), among which the top-down decision-making structure is the most common in China (Yuan *et al.*, 2020). As Yuan *et al.* explain, the top-down structure is institutionally compulsory with local governments being the entities responsible for the fundamental job of housing demolition (planning, financing, and implementation). To be specific, Cheng (2012) points out that the development mode is government-led, where governments and developers have a superior position, compared to affected households and communities, because governments dominate the whole process.

3.2.2 Wealth effects on household financial decisions

Chinese households regard property as an important asset, and the homeownership rate in China is approximately 90% above the average world level of around 60% (Li and Wu, 2014). Therefore, massive housing demolitions have far-reaching impacts on Chinese households. In essence, housing demolitions are a kind of replacement process. Households lose their original houses and get in-kind or monetary compensation from local authorities, leading to an exogenous wealth shock to those households having experienced housing demolitions (the demolished households). From the perspective of intertemporal models, there are two crucial conditions determining the impacts of external wealth shocks (negative or positive) on household choices: whether the shocks are permanent in nature or just transitory and whether households can administer the shocks via financial markets (Christelis *et al.*, 2015).

Firstly, one important aspect is whether wealth shocks are permanent or transitory. Indeed, most financial wealth changes from the fluctuations of stock prices, especially short-term variations, can be regarded as transitory (Mcmillan, 2013). In the context of a housing demolition, the sudden change in household wealth, coming from the agreement of the compensation contract between the demolitioners and demolitionees (entitled homeowners and tenants), does not change over time – hence the wealth shock is permanent. The compensation contract defines the compensation method (in-kind, monetary or a combination of both), the amount of monetary compensation, the relocation arrangements of in-kind compensation, the demolition timing and any agreement for the transition period (Rafferty, 2011). This feature is essentially different from other inducements of wealth shocks, which fluctuate with the prices of financial subject matters (e.g., stocks or housing assets). Compared with transitory fluctuations of wealth, permanent variations are more important as a determinant of household portfolio decisions (Wachter and Yogo, 2010).

Secondly, based on the housing compensation contracts, compensation can take two forms – in-kind and monetary, leading to heterogenous wealth effects for households. The liquidity of different wealth types determines the degree of difficulty when households plan to evaluate and liquidise their wealth, and the related transaction costs offset the wealth effect of certain types, thus limiting the extent to which the financial constraints are relaxed (Bostic *et al.*, 2009). Compared with monetary compensation, in-kind compensation has lower liquidity and possibly induces transaction costs leading to a lower housing wealth effect.

Thirdly, apart from the nature of wealth shocks (permanent or transitory) and the liquidity of certain wealth types, mental accounts proposed by Thaler (1990) can be used to explain the different responses of households towards financial and housing wealth shocks. The concept of mental accounts describes that households have multiple mental accounts for different financial assets, and such psychological and cognitive differences in certain types of wealth lead to heterogenous behaviours and choices towards different wealth types (Bostic *et al.*, 2009; Thaler, 1999; Toussaint, 2011). In addition, housing assets have dual attributes – the wealth attribute and the commodity attribute (Juster *et al.*, 2006). Especially for younger households, the increase in housing values changes the anticipated housing consumption in the future and accordingly offsets the positive housing wealth effects on current consumption (Bostic *et al.*, 2009; Skinner, 1996). Both monetary and in-kind housing compensation lead to the change of wealth, potentially performing the function of a precautious buffer that can be utilised for future contingencies (Skinner, 1996).

The effect of wealth shocks (the wealth effect) towards household portfolio distribution at the household level is ambiguous. Theoretically, under the strict assumption of no market friction, the asset allocation for investors with constant relative risk aversion (CRRA) does not change with wealth (Samuelson, 1969). However, from the empirical perspective, various conclusions are obtained. There are many empirical studies investigating the relationship between household wealth and household portfolios using cross-sectional data (Cohn *et al.*, 1975; Campbell, 2006; Wachter and Yogo, 2010; Calvet *et al.*, 2007; Alessie *et al.*, 2000; Cocco, 2005). Among them, using survey data for the US, Cohn *et al.* (1975)

find that the proportion of risky assets to total wealth increases when individual wealth increases, implying decreasing relative risk aversion. After being aware of the scarcity of household panel data with rich information on household wealth and financial portfolios, Alessie *et al.* (2000) use the CentER Savings Survey panel data finding that in the Netherlands, the increase in household net wealth encourages households to hold higher shares of risky assets.

Brunnermeier and Nagel (2008) provide empirical evidence, based on the Panel Study of Income Dynamics (PSID), showing that changes in household liquid wealth affect the participation of investing in risky assets but do not explain the variation of the holdings of risky assets (measured as shares of total financial wealth at the household level). The authors also reject the economic assumption of slow rebalancing of household assets in response to past wealth changes (wealth inflows and wealth outflows), considering the dynamic wealth effect is shown to be tiny. Brunnermeier and Nagel argue that one explanation is the inertia phenomenon of reallocating household portfolios, given the transition costs. The inertia phenomenon is also emphasised and addressed by Calvet and Sodini (2014) through introducing the passive counterpart of the share of risky assets ("the passive risky share"), which is observed after a period of inactivity.

Additionally, based on panel data from 1989 to 2004 from the Survey of Household Income and Wealth (SHIW) by the Bank of Italy, Chiappori and Paiella (2011) get mixed results varying with the definitional ranges of financial assets (including and excluding business equity). The structure of investors' portfolios (the allocation between the risky and the riskless) does not change when wealth changes, even when the wealth variations are very large, from a two-stage model. However, after broadening the risky assets definition with the inclusion of private business equity, a positive wealth effect is observed, showing that the wealth change induces a concurrent change of the risky asset share due to the inherent viscosity of private business equities (indivisibility, informational imperfection, etc.). Specifically, looking at those households simultaneously having "standard" risky assets and business equity, the positive wealth effect is associated with the increase in the share of business equity holdings

and the decrease in other risky assets shares. See Moskowitz and Vissing-Jørgensen (2002) for further illustrations of the business equity puzzles.

Similar to the work of Chiappori and Paiella (2011), based on the UK Wealth and Asset Survey, Paya and Wang (2016) also study the decisions of household asset/debt holdings in response to wealth fluctuations when assuming different wealth perceptions of people in decision-making (liquid wealth minus debt, liquid wealth only, or perceiving private business equity, housing equity or pensions as part of wealth). The results are consistent with the findings of Brunnermeier and Nagel (2008) and Chiappori and Paiella (2011), supporting zero elasticity of risky assets to wealth when a narrow definition of wealth is adopted. Meanwhile, the inclusion of other wealth categories makes the estimated results and interpretations more complicated. For example, whether pension wealth is categorised into risk-free assets or risky assets is a main concern of this empirical work and influences the results. From the existing literature, the measure of wealth is important for the studies of household asset allocation. This analysis adopts a narrow measure of household wealth, and in the data and variables section, details are provided to clarify this concern.

Apart from household wealth, many other demographic characteristics play a role in household portfolio allocation. The first type of variables comprises objective variables. The empirical results of King and Leape (1998) suggest that considering the costs needed for obtaining and processing information in the asset rebalancing processes, the occupation (managerial, professional or neither) and education (having received higher education or not) characteristics of the household economic respondent play major roles in the allocation of different assets. Less educated people face higher income uncertainties and need more precautious savings, thus leading to greater responses to wealth shocks (Painter *et al.*, 2022). In Sweden, a country with high participation rates and diversification levels of risky assets, in the processes of constructing the financial sophistication index, Calvet *et al.* (2007) find that the education and wealth of households are positively associated with the participation, volatility and efficiency in forming risky portfolios.

As for the age effects in the household portfolio composition choices, the inclusion of age reveals the change in household portfolios when households age. A basic theory related to the age profile is the life cycle hypothesis, and as predicted with the life cycle model, a hump-shaped profile between age and risky assets is found in both France and the United States, with the shape of France being flatter (Kessler and Wolff, 1991). Households accumulate wealth and tend to participate in risk asset markets when young, rebalance household portfolio composition when getting close to retirement, and exit the financial market and decumulate household wealth after retirement (Fagereng *et al.*, 2017). Brunetti and Torricelli (2010) find the hump-shaped age profile of household portfolios changes over time in Italy. Generally, the holdings of risky assets are low for young people (Jin, 2011); even if the participants of financial markets are aware of the equity premium, young households are credit-constrained in holding risky assets (Haliassos and Michaelides, 2000).

When exploring the consumption responses towards wealth shocks, there is evidence supporting that the wealth effects are heterogeneous among homeowners and renters, but there is no evidence supporting the heterogeneity between young and old homeowners (Disney *et al.*, 2010). Using data drawn from the Bank of Italy Survey of Household Income and Wealth between 1993 and 2006, Bertocchi *et al.* (2011) find that marriage itself can be regarded as a kind of safe asset and married households tend to have a higher probability of investing in risky assets. The marital status gap of household risk asset participation is higher for households with a female economic respondent for two potential reasons: being more risk averse among women and a heightened exposure to labour market risks (Bertocchi *et al.*, 2011).

The second category of variables influencing the wealth effect encompasses subjective variables, such as financial literacy and risk attitudes. Household decisions are also influenced by many other factors, such as the financial literacy (Feng *et al.*, 2019) and the risk attitude (Brown *et al.*, 2013) of decision makers. Risk attitudes partially determine people's reaction towards the change in housing wealth given housing is a risky asset (Liao *et al.*, 2014). Based on the data from the US Consumer Expenditure Survey, the housing wealth effect is different for households with different risk attitudes (Liao *et al.*, 2014).

Specifically, the magnitude of the positive relationship between risk attitude and household consumption is bigger for households with higher risk tolerance.

3.2.3 Wealth effects on household consumption decisions

There are two basic classical theories that can be used to support the effects of wealth shocks on consumption: the permanent income hypothesis proposed by Friedman (1957) about the consumption behaviours toward permanent shocks; and the life cycle hypothesis by Ando and Modigliani (1963) about the consumption smoothing over time. Based on both theories, consumption behaviour may be influenced by unanticipated wealth shocks, affecting the permanent income and thereby pushing the adjustment of the consumption pattern over the remainder of the life cycle (Márquez *et al.*, 2013; Christelis *et al.*, 2015; Lettau and Ludvigson, 2004; Browning *et al.*, 2013). There is a valid association between household consumption responses and permanent wealth changes for the empirical studies of most countries (Paiella, 2009; Case *et al.*, 2005; Disney *et al.*, 2010), but no significant relationship is found between transitory variations and consumer spending (Lettau and Ludvigson, 2004). This fact reveals the importance of the classification and decomposition of wealth shocks in studying consumer spending.

As mentioned above, there are two forms of housing demolition compensation, in-kind or monetary. For both types with different liquidity, an unexpected wealth gain prompts a redistribution of wealth over the life cycle, leading to an increase in consumption (Boone and Girouard, 2003). Boone and Girouard (2003) and Márquez *et al.* (2013) propose there are two channels (direct and indirect) to smooth consumption over the remainder of life. The direct channel is to liquidise assets of all types to finance consumption, and the indirect channel is to utilise the increased borrowing capacities with the incremental wealth, assuming that the wealth shock is positive.

The relaxation of credit constraints may result in an increase in consumption as positive wealth shocks facilitate household borrowings and consumption smoothing over life cycles (Paiella, 2009). The latter channel is restricted by many macro factors, i.e., the maturity of local financial markets and the regulation of authorities (Márquez *et al.*, 2013). There is convincing evidence of a relationship between wealth shocks and household consumption choices. Taking the costs of changing consumption behaviours into account, considerable income or wealth shocks may lead to consumption smoothing (Browning and Collado, 2001).

However, similar to the inertia phenomenon in household asset allocation, there is also a phenomenon of consumption stickiness in the wealth effect on household consumption behaviours (Flavin, 1981; Campbell and Deaton, 1989; Carroll *et al.*, 2011). Put differently, the wealth effect may not emerge immediately due to the stickiness of consumers' habits, and it takes time to accumulate and show up (Liao *et al.*, 2014). Flavin (1981) proposes that consumption movements are positively related to the lagged income variations, against the classical permanent income hypothesis. After that, Campbell and Deaton (1989) fit multiple models to verify the smooth consumption pattern in the real world and provide some possible reasons like the existence of market frictions and people's habit formation. These stylised facts do not reconcile with the classical models of consumption because people have weak or delayed consumption responses towards wealth changes.

Recently, there are many empirical studies aimed at investigating the background reasons for the stylised facts regarding the sluggishness of the wealth effect (see, e.g., Chetty and Szeidl, 2004; Reis, 2006; Sommer, 2007; Carroll *et al.*, 2020). The existence of the habit formation processes makes the wealth effects on consumption spread out into the future through the autocorrelation of consumption growth series (Zhou and Carroll, 2012). Specifically, the inclusion of habit formation allows heterogeneous risk preferences and continuous effects on aggregate consumption (Chetty and Szeidl, 2004). However, when focusing on food consumption, little evidence is found to support habit formation using the Panel Study of Income Dynamics (Flavin and Nakagawa, 2008), which suggests that food consumption is sensitive to external shocks.

Generally, wealth changes brought by different sources lead to various responses in consumption (Elliott, 1980; Lettau and Ludvigson, 2004). Following previous research on the wealth effects on household consumption, wealth changes can be classified into the fluctuations of general wealth, financial wealth (in most cases, the stocks), or housing wealth (Zhou *et al.*, 2016). It is reasonable to assume that the wealth shocks from housing and financial assets exert different wealth effects on consumption because housing and financial assets differ in many aspects (i.e., asset liquidity, tax burdens/benefits, individual preferences, etc.; see Poterba, 2000; Case *et al.*, 2005; Zhou, Chang and Gibler, 2016).

As for the financial wealth effects on consumption, Poterba (2000) compares several studies using the Panel Survey of Income Dynamics, finding that most of the literature provides supporting evidence for a positive marginal propensity to consume for household wealth, even if the magnitudes differ across the studies, and some suggest a higher level of reaction towards the wealth shocks of stock values. As such, using multiple panel techniques with common coefficients, fixed effects and recursive demeaned approaches respectively for the G7 countries, Mcmillan (2013) identifies that stock prices and dividend yields positively affect consumption behaviour, signalling the future performance of the assets. Such positive and significant stock market wealth effects are also examined and found for sixteen emerging countries by Funke (2004) and fourteen OECD countries by Shen *et al.* (2014).

Turning to the housing wealth effects on consumption, the liquidity of housing wealth is intrinsically smaller than that of financial wealth (Disney *et al.*, 2010). There are three mechanisms linking household housing wealth gains/losses with household consumption, which are the wealth mechanism, the collateral mechanism, and the common causality mechanism respectively (Suari-Andreu, 2021; Attanasio *et al.*, 2009).[26] The first mechanism (the wealth effect) mentioned by Suari-Andreu describes

[26] Apart from these three mechanisms, Browning, Gørtz and Leth-Petersen (2013) mention that the fourth mechanism, the financial liberalisation mechanism, influences almost all consumers. Considering that the liberalisation of financial markets affects all households across the board, this chapter does not include this macro factor assuming that financial liberalisation was a constant factor in China between 2013 and 2017.

that households have their financial and consumption responses when facing an unexpected wealth shock. From the perspective of the life cycle, wealth shocks add new information to the process of decision-making and change the evaluation of households' lifetime wealth, thus affecting financial and consumption decisions (Browning *et al.*, 2013). The wealth channel assumes that little borrowing is involved, and homeowners have consumption responses via utilising the housing wealth increments (Pan and Wu, 2021).

The second mechanism comes into play when housing wealth is treated as collateral exclusively for homeowners to finance households' consumption via financial markets. The increase in housing asset prices, generating additional equity for households, leads to the relaxation of household collateral and borrowing constraints (Browning *et al.*, 2013). The third mechanism suggests that there exist some variables (common factors, e.g. technological innovations) influencing both household housing wealth and consumption simultaneously. Attanasio *et al.* (2009) examine the common causality hypothesis by introducing productivity growth as the common factor, and Bulusu *et al.* (2015) use the growth of non-housing wealth to proxy the common factor. Both aim to determine the extent to which the common factor progress can be used to explain housing wealth effects, therefore proving the validity of the common factor mechanism.

Many US studies demonstrate that increases in household wealth lead to a corresponding rise in household consumption (i.e., Case *et al.*, 2005; Carroll *et al.*, 2011). This relationship between wealth changes and consumption is applicable to many other countries or districts, for example, in the UK (Márquez *et al.*, 2013) and in Singapore (Edelstein and Lum, 2004). The estimated marginal propensity to consume (MPC) indexes for housing wealth are positive and ranged from 0.02 to 0.07, implying a significant positive effect of housing wealth shocks on family consumption (Painter *et al.*, 2022; Bostic *et al.*, 2009). The housing wealth effects are significantly greater in magnitude than the financial wealth attitudes (Bostic *et al.*, 2009).

In contrast, when looking at some Asian countries, there are some obvious inconsistencies. Phang (2004) finds that, in contrast to income changes which have a positive and significant impact on consumption, housing wealth shocks, both expected and unexpected, have no impact on aggregate consumption, nondurable consumption or nondurable consumption (excluding rents and utilities). Aron *et al.* (2012) report a negative relationship between housing wealth and consumption. The authors of both studies regard high bequest motives of people as one possible explanation for the anomalies. When bequest motives are manifest, faced with higher housing assets, individuals may consume less to give larger bequests to the next generation as successors will face higher spending on housing in the future (Skinner, 1989), then mitigating the wealth effects (Nakajima and Telyukova, 2017). This is relevant to the dual functions mentioned below because higher asset values in housing are closely associated with higher prices of housing-related goods and services.

The vague impacts of housing wealth on household consumption are of great interest. In a deterministic world without borrowing constraints and financial frictions, under the permanent income hypothesis, households can smooth their consumption by sticking to a simple strategy of consuming a constant fraction of their permanent income (Liao *et al.*, 2014). This goal is difficult to achieve due to the existence of borrowing constraints and imperfect financial markets, but the increase in housing wealth relaxes borrowing constraints to varying degrees with houses as collateral (Painter *et al.*, 2022). In addition, the increase in housing wealth is often accompanied by the increase in anticipated future housing consumption, which offsets the positive effect of the increase in housing wealth on consumption given the anticipated budget constraint constant over the life span of households (Painter *et al.*, 2022; Attanasio *et al.*, 2009; Flavin and Nakagawa, 2008). These two opposite factors, positive wealth shocks and higher expected consumption, jointly result in a smaller wealth effect than the coefficients predicted by classical models and provided in some empirical studies (Bostic *et al.*, 2009). Considering that there are factors potentially offsetting the positive impact of the “pure” housing wealth, the aggregate housing wealth effect can be positive, negative and even zero.

With an intertemporal consumption framework, only when households plan to decumulate or downsize their housing wealth, there is a significant housing-wealth effect (Flavin and Nakagawa, 2008). This mechanism is called the "pure-wealth effect" in Painter *et al.* (2022), exclusively focusing on the increase in housing wealth while isolating other corresponding changes that affect the aggregate propensity to consume for housing wealth. Under the pure wealth hypothesis, based on the framework of the life-cycle model, the housing wealth effect on consumption is predicted to be higher for older homeowners and smaller for young homeowners who are unable to decumulate housing wealth in the near future and have to keep housing wealth for longer time (Painter *et al.*, 2022; Sinai and Souleles, 2005). However, the phenomena of zero or weak housing wealth effects are not rare in the real world, with a negligible marginal propensity to consume out of household housing wealth (Suari-Andreu, 2021). Based on the British Household Panel Survey data between 1994 and 2003, Disney *et al.* (2010) find that the estimated marginal propensity to consume after experiencing unanticipated housing wealth gains is about 0.01, lower than most empirical results (Disney *et al.*, 2010).

The housing wealth shocks can be either positive or negative. It is not reasonable to assume a symmetric reaction toward both types of wealth shocks (Márquez *et al.*, 2013). Looking at the housing wealth losses after the real estate bubble burst, Zhou and Carroll (2012) find that the adverse shocks strongly depress consumption in the context of the US. The impact of housing wealth losses due to house price changes on household consumption outweighs the impact of housing wealth gains (Engelhardt, 1996; Skinner, 1989). Similarly, the empirical results of Stevans (2004) illustrate that consumers immediately respond to a positive shock of equity values to fill in the difference between the actual consumption level and the target one but do not symmetrically change towards an equivalent shock of the decline in the stock market.

The asymmetric consumption responses towards positive and reverse wealth shocks cannot be monitored in all empirical studies. For example, using the British Household Panel Survey data, Disney *et al.* (2010) conclude that there is not a significant fact of different consumption responses towards wealth gains and losses in the UK. Afterwards, through adding interaction terms between gains/losses

and a variable indicating households with self-reported negative equity, Disney *et al.* find that the wealth effect on consumption for households with negative equity is disproportionately larger than the wealth effect for households with positive equity, verifying that the asymmetry of household consumption responses exists in specific groups.

By investigating the wealth cycle of the US during the period between 1990 and 2002, Donihue and Avramenko (2004) demonstrate that the asymmetric effects exist in the short term and gradually disappear till reaching the target consumption level over time, and at the same time, the liquidity of the wealth component determines the path of the convergence processes. From the perspective of behavioural economics, Márquez *et al.* (2013) find households and individuals are more sensitive towards wealth losses than gains due to loss aversion and the nonlinear forms of the utility functions. All these empirical findings verify that the wealth shocks on consumption exist and reject the symmetry assumption of the wealth shocks. This stylized fact is the asymmetry of consumption responses towards housing wealth changes.

Comparing the two common wealth categories in the existing literature, financial wealth and housing wealth, looking at the panel data of 14 developed countries (including the US and the UK) and panel data solely for the US, Case *et al.* (2005) reach the same conclusion that housing price shocks have greater impacts than stock price shocks on the consumption of households. However, the opposite findings are reported in Ludwig and Sløk (2004) from the evidence of sixteen OECD countries and Dvornak and Kohler (2007) for Australia. Moreover, even if Campbell and Cocco (2007) arrive at similar conclusions as Case *et al.* (2005), they find that the wealth effects are heterogeneous for different age groups using microdata from the UK Family Expenditure Survey.

In the context of China, many empirical results support the positive wealth effects for aggregate consumption (e.g., Ciarlone, 2011; Koivu, 2012). Ciarlone (2011) finds that wealth has a positive impact on household consumption with different elasticities for different wealth categories. Adopting a Structural Vector Autoregression (SVAR) method, Koivu (2012) claims that the wealth effect is

positive in China. For most Asian countries or districts, stock wealth effects on consumption in response to stock wealth changes are significant, while housing wealth effects are insignificant, indicating a high level of persistence and sluggishness to wealth shocks (Peltonen *et al.*, 2012). Using annual data across 29 provinces from 1991 to 2007, Wu *et al.* (2012) find that the stock wealth effects vary with the stockholder size (the number of stockholders), the home ownership and the income level at each region.

Furthermore, the asymmetry phenomenon exists in the stock wealth effects (Hu and Guo, 2012) and the housing wealth effects (Qi and Huang, 2013). From the existing literature for China, there are many conflicting empirical results on both the direction and the magnitude of the stock wealth effects. Moreover, the research on the housing wealth effects is limited, especially at the micro level (Zhou *et al.*, 2016). Using panel data from 1999 to 2010 derived from the China Statistical Yearbook, Zhou *et al.* conclude that a positive asset shock (both stocks and housing) leads to an increase in consumer spending, at least in the long run, and larger responses towards positive shocks are observed.

Overall, wealth shocks not only exert an impact on household consumption decisions but also influence the financial decisions of households. On the one hand, Juster *et al.* (2006) find that a positive shock in the financial markets led to a decrease in individual saving rates from 1984 to 1999. Based on the 2011 and 2013 waves of the CHFS datasets and the linear probability model (LPM), Cai *et al.* (2018) find that affected households are more likely to start small and medium businesses because the subsidies relax household financial constraints to some extent. On the other hand, using panel data from the Chinese Family Panel Studies (CFPS) and a difference-in-difference methodology, Li *et al.* (2019) show that urban housing demolition exerts a significant positive shock on households' wealth and suppresses the labour market participation of affected household members.

Before entering the main analysis of considering the demolition effect, it is important to point out the uniqueness of housing. Housing is an important component of household wealth and has the characteristics of both assets and durable commodities (Chiappori and Paiella, 2011; Zhou *et al.*, 2016). After being aware of the dual functions of housing, rising house prices usually have two direct

consequences: a higher level of wealth; and (anticipated) higher consumption of housing services (Zhou *et al.*, 2016).

It is worth noting that the impacts of mass expropriation show a degree of heterogeneity across the population. Day and Cervero (2010) focus on urban residents of the biggest city Shanghai in China, who are required to migrate from the central districts of the city to the periphery areas. This migration is both voluntary and involuntary. The authors find that demolitions have heterogeneous impacts on willing and reluctant household movers. Generally, low-income households are more fragile than other households when facing involuntary relocation (Guan and Xu, 2018). For example, in the empirical study of the Indian western city of Pune, Kapoor *et al.* (2004) find that the welfare of the poor slum movers and the dwelling conditions decreased after relocation, which was lower than those of other relocated households living in the formal non-slum settlements, especially when there was not any policy intervention and economic compensation. Similarly, for the second-largest Indian city, Delhi, Anand and Tiwari (2006) find that forced relocation worsened the living conditions and social status of poor households, partially due to the loss of living opportunities and the deprivation of locally available transport modes.

Besides, Wang *et al.* (2021) compare households that change their Hukou status from rural to urban with comparable households (constructed based on the propensity score matching models), following Chen *et al.* (2015). The empirical results show that the latter households consume more than the matched group (about 2.4% per capita higher in the consumption within households, on average) since urban households are more productive and eligible for multiple compensations (i.e., demolition compensation). The authors argue that one potential reason for this finding is that they obtain an advantageous position after transferring their Hukou status. Being in a weak position makes urban migrants with rural Hukou have relatively lower permanent income expectations, save more, and consume less (Chen *et al.*, 2015).

The most direct consequence of residential relocation is geographical or environmental changes, which are closely associated with the daily consumption of transportation and commuting. In particular, the urban mass restructuring and residential resettlement in Chinese cities, providing new conditions and different resources of transport, contribute to the changes in residents' travel choices based on the movers' preferences and other determinants of the transformations (i.e., the household size and some life-course events including the birth of new household members and the marriage, e.g. Zhao and Zhang, 2018).

In some studies, the causal relationship between the given environment (like residential relocation) and travel choices is ambiguous, existing or not, and unidirectional or bi-directional (see Cao *et al.*, 2007 for the detailed literature review of the causality issue; and see Scheiner and Holz-Rau, 2013 for the discussion in the contexts of Germany, Wang and Lin, 2014 in the Chinese contexts and Olsson and Tanangsnakool, 2017 for Thailand). However, the influence of residential self-selection is negligible in this chapter because large-scale passive housing demolition is exogenous (Qu *et al.*, 2021) because households have limited control over the demolition decisions (Kleinhans and Kearns, 2013; Li, Kleinhans, *et al.*, 2018). Therefore, housing demolition provides a good chance to study the wealth effects at the household level from a new perspective.

3.2.4 Housing demolitions as a natural experiment

From a technical standpoint, this chapter treats housing demolitions as a quasi-natural experiment and regards related housing demolition compensation as an external shock to households. The strategy of employing housing demolition as a natural experiment has been used in some existing empirical studies of Chinese housing demolition (Cai *et al.*, 2018; Chyn, 2018; Zhou, 2018; Shi and He, 2022). The employment of this method effectively addresses the potential problem of endogeneity and self-selection bias relying on the assumption that housing demolition is random and exogenous (Shi and He, 2022). In the quasi-natural experiment of housing demolitions, affected households are classified as the

treatment group and unaffected households are categorised as the control group. The differences between the treatment group and the control group are used to identify the impacts of housing demolitions in the experiment.

Treating the incidence of housing demolitions as the treatment is feasible in China because the land in China is not owned by individuals and households – urban land is owned by the state and rural land is "collectively owned" (Zhao and Liu, 2022; Wang *et al.*, 2023). For public interests, housing demolition can be determined and implemented following four steps: (1) local authorities submit the application for approval to the administrative department; (2) the competent department responsible for housing demolitions publicly releases the decision and notifies households that will be affected; (3) the implementors negotiate with affected households and in some cases apply for a forced demolition to local courts (for example, when households refuse to move out without administrative reviews or lawsuits against housing demolitions); and (4) housing demolition is conducted, and compensation is offered to affected households (Zhao and Liu, 2022; Ho, 2013).

The separation of land ownership and usage rights gives local authorities monopoly power in housing demolition (Zhao and Liu, 2022). Shi and He (2022) indicate that the treatment of housing demolitions is determined and regulated by local governments based on public economic and social concerns, and households have little control over the decision of housing demolition and the corresponding compensation they receive for being affected. Wang *et al*. (2022) also insist that households cannot determine their selection for housing demolition. Generally, households cannot self-select whether to be involved in housing demolitions after local governments determine the scope and timing of housing demolition projects (Shi and He, 2022). Therefore, housing demolitions are exogenous when the quasi-experiment subjects are households.

Following the guidelines of fair compensation in the 2011 regulations, the reference prices for housing demolitions should not be lower than the market prices of expropriated properties, and the living conditions should not be worse after housing demolition (Cao and Zhang, 2018; Shi and He, 2022).

Accompanied by the housing boom, most affected households face a positive wealth shock after housing demolition (Liu and Wong, 2018; Shi and He, 2022). Based on the biennial datasets of the China Family Panel Studies (CFPS), Sha and Zou (2022) find that the housing wealth of affected households ever experienced housing demolition increases by 14%, providing evidence to support that housing demolition has a positive shock on household wealth.

Using a difference-in-difference strategy based on the Chinese Family Panel Studies (CFPS), Li and Xiao (2020) find that the demolished households, on average, have more wealth, about 15 times the 2016 individual disposable income, than other households. Specifically, the incremental wealth shock of both forms is estimated to be approximately 360,000 in Chinese yuan based on panel data (the waves of 2012, 2014 and 2016) of the CFPS (Li *et al.*, 2019). The affected households are estimated to have houses with bigger areas or higher values and more liquid financial assets (cash and deposits) after housing demolition (Li and Xiao, 2020; Li *et al.*, 2019). In this chapter, the purpose is to study how households react towards sudden and significant wealth shocks. While the existing literature focuses on one or two aggregate aspects (i.e., houses, cash and savings) of the wealth effect, this chapter is the first to thoroughly consider the influence of demolitions on financial composition and consumption behaviours at the household level.

The rapid and continuous growth of house prices in China over the past two decades (Cai *et al.*, 2018; Li *et al.*, 2019; Liu and Xu, 2018), as shown in Figure 3.2, generates additional benefits for households ever experiencing housing demolitions and receiving compensation. Even taking other factors (e.g., house quality and developers' price strategies) into account, the trend of an innovative quality-adjusted house price index developed by Wu *et al.* (2014) show that the annualised compound growth rate of Chinese house price is approximately 11.5% keeping the quality of houses unchanged over time. The housing appreciation in a relatively shorter period has prompted local authorities and developers to provide higher housing demolition compensation to beneficiaries (Liu and Wong, 2018). Affected households receiving in-kind compensation or transforming monetary compensation into housing wealth effectively become wealthier, along with the rise of house prices (Shi and He, 2022).

In essence, the nature of housing compensation is different from other assets. Relocated households with housing demolition categorise the related demolition compensation into the mental account of windfalls (Yuan and Huang, 2018; Li *et al.*, 2019). Households with windfalls behave differently due to the intrinsic difference between windfalls and regular salary incomes. Unexpected windfall gains and regular labour income fall into separate mental accounts associated with various consumption preferences and behaviours (Kivetz, 1999). The theory of mental accounts was coined in 1985 by Richard Thaler, suggesting that individual and household perceptions of gains matter in consumption decisions (Thaler, 1985). Psychological experiments in the 1990s show that windfalls are more likely to be "stored" in a kind of temporary mental account due to its nature of unpredictability, in which money has high proclivities to be spent (Arkes *et al.*, 1994). Considering these psychological and behavioural reasons, different types of financial assets are not perfect substitutes, meaning that a dollar of windfalls is perceived as exclusively discretionary compared with a dollar of other assets (Juster *et al.*, 2006).

There are many methods of categorizing mental accounts in the psychological literature (i.e., Kahneman and Tversky, 1984; Henderson and Peterson, 1992; Thaler, 1999; Li *et al.*, 2014). In the context of China, a "3-4-2" structure of mental accounts is raised by Li *et al.* (2007). The three categories of mental income accounts are regular income, windfall income, and investment income. The four mental expenditure accounts are necessities, family development, social networks, and hedonic aspects respective. Finally, the two saving accounts are the security saving account (cash, deposits and fixed assets) and the risky investment accounts. Li *et al.* (2007) conclude that this mental account pattern (3-4-2) suits the decision behaviours of Chinese people well, based on a psychological survey with 1,268 respondents from nine provinces. Obviously, the exogenous wealth shocks will enter the windfall accounts changing the structure of the income account. By studying the financial behaviours of household portfolios and the consumptive behaviours of various categories in this chapter, it is possible to test whether there are connections among the three mental accounts.

In conclusion, the incidence of housing demolitions in China forms a quasi-natural experiment, and demolition compensation exerts positive wealth shocks towards affected households, thus influencing their financial and consumption decisions (Zhao and Liu, 2022). The external wealth shocks, assumed to be random and heterogenous, resulting from the housing demolition compensation provide a good opportunity to study the effects of a wealth shock on household financial and consumptive decisions in China. Considering housing demolition exerts an external impact on households, many empirical studies show that those households which have experienced demolition correspondingly change their behaviours substantially after receiving the demolition subsidies (i.e., household entrepreneurial activities by Cai *et al.*, 2018).

3.2.5 Empirical studies on Chinese housing demolitions

The empirical results on China provide evidence supporting a significant and distinguishable wealth effect on consumption, but the marginal propensity to consume is relatively lower than that in other countries due to the limited operations in underdeveloped financial markets (Painter *et al.*, 2022). Through studying the housing wealth effects in different Chinese cities, empirical evidence suggests that the significance and magnitude of housing wealth effects due to the increase in housing prices depend on the development of local financial markets (Dong *et al.*, 2017), in line with the empirical findings of other countries, e.g. Denmark (Browning *et al.*, 2013).

The empirical research regarding the impacts of housing demolition on household decisions in China has attracted great attention in recent years. First, as shown above introducing Chinese housing demolition, until the year of 2011 when the No. 590 order of the central government was published, the housing compensation system was gradually improved, and the current standardised compensation system was then established. Second, both mainstream nationally representative datasets (the CFPS and the CHFS) are gradually built and released to the public since the 2010s. Limited by the policy

uncertainties and data availability, empirical studies on Chinese housing demolition at the household level started late.

Huang *et al.* (2020) compare voluntary relocations to meet individuals' housing needs and involuntary relocations to meet collective housing needs in Western countries. They find that both monetary and in-kind compensations of forced relocations make the demolition outcomes (i.e., housing conditions and satisfaction levels) better in China using the CHFS. Nevertheless, the effects of demolitions on households' decisions are still unclear (Zhou, 2018). Based on the setting of treating housing demolition as a quasi-natural experiment, there are some empirical studies based on Chinses microeconomic datasets (Chyn, 2018; Cai *et al.*, 2018; Zhou, 2018; Zhao and Liu, 2022). The quasi-natural experiment approach effectively addresses the endogeneity problem, assuming that the wealth shocks due to housing demolitions are random and exogenous (Shi and He, 2022). Wang *et al.* (2023) find that housing demolition reduces household labour supply. Based on the CHFS data, Shi and He (2022) show that households experiencing housing demolitions are more likely to participate in the investment of risky assets and invest more in risky assets. Also, using data from the CHFS, Cai *et al.* (2018) find that housing demolitions relax entrepreneurial credit constraints and increase the likelihood of starting household own businesses.

In a recent preprint study by Fan and Yang (2022), they also use housing demolitions as a quasi-experiment based on data from the CHFS. They find housing demolitions, as exogenous shocks, have a significant negative effect on household consumption. Fan and Yang also look at the relationship between housing demolitions and household consumption on necessities, concluding that housing demolitions have no significant effect on the consumption on necessities because the demand for daily necessities is inelastic. Overall, the existing literature on the impacts of housing demolitions in China is limited. This chapter extends the literature by providing more empirical evidence on the effect of housing demolition on household financial and consumption decisions.

3.3 Data and Variables

3.3.1 Data

This chapter uses the large-scale nationally representative longitudinal survey data, collected every two years, from the China Household Finance Survey (CHFS) dataset managed by the Survey and Research Centre for China Household Finance at the Southwestern University of Finance and Economics (Gan *et al.*, 2013). Until July 2021, there are four publicly available waves: 2011; 2013; 2015 and 2017, comprising of 8,438, 28,141, 37,289 and 40,011 households respectively. There is a sudden expansion of sample size from 8,438 in the 2011 wave to 28141 in the 2013 wave. The CHFS is a brand-new dataset, and in its first four waves the number of observations increases over time, meaning that there are new respondents entering the survey for each wave. Due to the observation limitation, Shi and He (2022) choose to exclude the 2011 wave when using the CHFS. After the 2015 wave, the number of observations is relatively stable (around 40,000).

Apart from the large sample size of the CHFS, another competitive advantage of this data source is the low refusal rates, compared to other alternative Chinese micro data sources at the household level (i.e., the Chinese Household Income Project and the Chinese General Social Survey), e.g. Chen and Ji, 2017; Li *et al.*, 2017, 2019. This dataset adopts a probability-proportional-to-size sampling method with three stages: sampling administrative counties proportional to the local population in the first stage; selecting communities in the second stage; and households in the third stage (W. Li *et al.*, 2019). Apart from the first wave, the other three waves are conducted based on a modern computer-assisted personal interviewing (CAPI) system, enhancing the overall efficiency and confidentiality of the CHFS (Zhang, 2020).

Considering the differences between the wave 2011 and the other three waves in terms of sample size and data collection methods, the 2011 wave is excluded from the empirical analysis. The subsequent

waves of the CHFS provide rich information on household financial and consumption decisions (i.e., financial assets, debt, and consumption) and detailed data on individual demographic and socioeconomic characteristics of household members. This chapter constructs three sets of dependent variables regarding household assets, debt and consumption, and related covariates influencing household financial and consumption decisions.

Table 3.1 Relevant demolition questions for all four waves

Wave	Relevant demolition questions	
	Has your family ever experienced a housing demolition or housing demolitions?	Did your family experience a housing demolition or housing demolitions in the past two years?
Wave 2011	Answered by all households	N/A
Wave 2013	Answered by new households in the sample	Answered by old households in the sample
Wave 2015	N/A	Answered by households chosen to answer questionnaire A
Wave 2017	Answered by households chosen to answer questionnaire B and new respondents	Answered by households chosen to answer questionnaire A

Note: From the wave 2015, there are two questionnaires with some respondents answering questionnaire 'A' and the remaining respondents answering questionnaire 'B'.

Furthermore, in the CHFS, there are two questions designed to obtain information on whether each household experienced at least a housing demolition in the past or in the past two years by asking "*Has your family ever experienced at least a housing demolition in the past*" or "*Did your family experience at least a housing demolition in the past two years*" (see Table 3.1). From this table, it is clear that not all respondents in each wave answer both demolition questions; especially in the year of 2015, a part of the respondents answering questionnaire 'A' only give answers to the second question. Under the Q&A session of the CHFS downloads page (https://chfser.swufe.edu.cn/datas/Home/HelpIndex), it is shown that when there are two types of questionnaires, questionnaire 'A' and questionnaire 'B', it means that some of the respondents are classified to questionnaire 'A' respondents and the remaining are classified to questionnaire 'B' respondents. However, there is no information telling whether the division is random or not.

As a consequence, to overcome the inconsistency of housing demolition questions, this chapter adopts a novel method to construct a quasi-experiment with the demolition-affected households between 2013 and 2017 as the treatment group. As shown in Table 3.1, questionnaire 'A' respondents answer the demolition question asking whether they experienced at least a housing demolition in the past two years in both the 2015 and 2017 waves. Combining these two waves, it is possible to identify whether each questionnaire 'A' respondent experienced at least a housing demolition in the past four years. For the remaining respondents, questionnaire 'B' respondents, even if they are not asked to answer demolition questions in the 2015 wave, they are asked whether they ever experienced a housing demolition in the past. If there were information informing whether these respondents ever experienced housing demolition in the 2013 wave, it would be possible to identify those demolition-affected households in the past four years. That is, among questionnaire 'B' respondents in the 2017 wave, a household would be classified as a demolition-affected household in the past four years if this household did not experience a housing demolition in the past in the 2013 wave but was reported a demolition-affected family in the 2017 wave.

More specifically, as shown in Table 3.2, all respondents can be divided into two parts, the respondents answering questionnaire 'A' and the remaining respondents answering questionnaire 'B'. For the former, according to their answers (Yes/No) to housing demolition questions, there are eight different combinations (see Table 3.2). Households that did not ever experience any housing demolition in all three waves are assigned to the control group, while households that are reported to be non-demolished in the 2013 wave but demolished in the 2015 and 2017 waves are assigned to the treatment group. For the remaining four groups, the respondents are not appropriate to be included in the sample because it is impossible to distinguish the impacts from the treatment between 2013 and 2017 and the treatment before 2013.

Table 3.2 Construction of the treatment variable

Part A: for the respondents answering questionnaire 'A'

Wave 2013	Wave 2015	Wave 2017	
Has your family ever experienced a housing demolition or housing demolitions?	Did your family experience a housing demolition or housing demolitions in the past two years?	Did your family experience a housing demolition or housing demolitions in the past two years?	Assigned to the treatment group or the control group, or removed from the sample?
No (7,724 observations)	No	No	Control (7,446 observations)
	No	Yes	Treatment (188 observations)
	Yes	No	Treatment (61 observations)
	Yes	Yes	Treatment (29 observations)
Yes (725 observations)	No	No	Removed (650 observations)
	No	Yes	Removed (42 observations)
	Yes	No	Removed (24 observations)
	Yes	Yes	Removed (9 observations)

Part B: for the respondents answering questionnaire 'B'

Wave 2013	Wave 2017	
Has your family ever experienced a housing demolition or housing demolitions?	Has your family ever experienced a housing demolition or housing demolitions?	Assigned to the treatment group or the control group, or removed from the sample?
No	No	Control (6,986 observations)
No	Yes	Treatment (671 observations)
Yes	No	Removed (276 observations)
Yes	Yes	Removed (437 observations)

Note: After merging the 2013 and 2017 waves, there are 16,835 observations merged successfully. Among the 16,835 observations, there are 1,438 observations reporting ever experiencing at least one housing demolition in the past, accounting for 8.54% of the total sample. There are 16 observations with at least one missing value for the demolition variables in the waves 2015 and 2017 reporting whether households experienced at least one housing demolition in the past two years, which are removed from the sample. Finally, there are 949 observations assigned to the treatment group, in which households did not experience housing demolitions before 2013 but were affected by housing demolitions between 2013 and 2017, and there are 14,432 observations assigned to the control group, with 1,454 observations removed from the sample.

Similarly, the respondents answering questionnaire 'B' did not answer demolition questions in the 2015 wave. However, as shown in Part B of Table 3.2, they answered questions revealing whether they experienced housing demolition in the past in the 2013 and 2017 waves respectively. Depending on their answers, households who never experienced housing demolition in the 2013 and 2017 waves are assigned to the control group. Households who did not ever experience housing demolitions in the 2013 wave but ever experienced at least one housing demolition in the 2017 wave are assigned to the treatment group. It is worth noting that the households who reported housing demolitions in the 2013 wave but no demolition experience in the 2017 wave provided contradictory facts. Thus, corresponding observations are removed. At the same time, due to the problem of identification, the households that reported housing demolition experiences in both waves are removed from the sample.

After combing the answers to demolition questions in both questionnaire 'A' and questionnaire 'B' (see Table 3.2), the variable indicating whether households experienced housing demolitions between 2013 and 2017 is obtained. There are two groups in the quasi-experiment, one treatment group including households who experienced housing demolition between 2013 and 2017 and one control group including households who did not experience housing demolitions during that period. The number of observations in the treatment group is 949, and the number of observations in the control group is 14,432. After these manipulations, a quasi-experiment is constructed with housing-demolished households as the treatment group and other households as the control group. The treatment is housing demolitions between 2013 and 2017. This chapter utilises information from the two waves, the 2013 wave and the 2017 wave before and after housing demolition (the treatment), to study the medium-term effects (i.e., after four years) of housing demolitions on household behaviours in relation to household financial asset allocation, debt holdings and annual consumption on different categories.

It is worth noting that in the CHFS, one household member of each household is assigned to be the household economic respondent, who knows household economic conditions most. In the CHFS, 70.06% of economic respondents, 19,715 out of 28,141 households, are household heads in the 2013 wave, while 61.64% of economic respondents, 24,662 out of 40,011 households, are household heads. All

family-level questions are answered by the economic respondents representing their families, with other household members playing a supporting role. Some individual-level questions are also designed for economic respondents rather than household heads, for example, subjective attitudes including risk attitudes, financial literacy, ethnicity, party membership, hukou status, health status, health insurance ownership, and pensions.

3.3.2 Dependent variables

This chapter constructs three sets of dependent variables. The first set is the financial asset ratios, measured by the proportion of households holding various sub-categories to household total financial assets, capturing the composition of household financial assets. Specifically, the household total financial asset value is measured by adding the monetary values of cash, current deposits, time deposits, stocks, bonds, funds, derivatives, financial wealth management products (i.e., bank financial products, internet financial products, online peer-to-peer microloans, brokerage services and so on), non-RMB denominated assets, gold and precious metal, and lending. Then, the financial asset ratios are calculated by dividing each financial asset category by household total financial assets. The proportions of each financial asset are used to measure household financial asset composition, reflecting the distribution of household financial resources.

The second set of dependent variables is the logarithm of each debt category. Regarding debt, the 2013 wave collects debt information about housing debt, vehicle debt, debt for other physical assets, business debt (agricultural and commercial), education debt, debt for credit cards, and other debt. However, in the wave of 2017, information related to these debt categories is not completely available. Considering the common debt information included in both waves, four types of household debt are considered in this chapter: housing debt, vehicle debt, education debt and credit card debt.

For housing, vehicle and education debt, the CHFS survey contains the monetary amount of each debt from banks and from other sources. Therefore, the value of each debt type is the sum of the value of each debt from banks and the value of each debt from other sources. The CHFS datasets also provide information on business debt and other types of debt. However, there are a lot of missing values for business debt. For business debt in the 2013 wave, there are 16,977 observations reported as missing values out of 28,141 observations. Considering the number of missing values, to avoid losing more than half of the observations in the 2013 wave, this chapter chooses not to use the business debt information and not to construct household total debt.

These four types of household debt are closely related to the activities of household members. Housing debt refers to any outstanding bank and non-bank loans for the purchase, expansion, decoration and reconstruction of houses owned by households. Vehicle debt refers to any outstanding bank and non-bank loans for buying any vehicle owned by families, including cars, buses, and trucks. Education liabilities contain any bank and non-bank educational loans for household members. Credit card debt is the total amount owed on bank credit card loans.

The third set of dependent variables is the consumption ratios to household income. Different from household assets and debt that belong to stock variables containing accumulative amounts, household consumption and household income are flow variables measured over a period of time (here, one year). Due to this reason, the consumption ratios used in this chapter are calculated by dividing each consumption sub-category by household income, indicating household consumption choices. The consumption categories used in this chapter include food, housing (i.e., bills and property management fees), daily necessities, family services, transportation, telecommunication, entertainment, clothing, housing maintenance, education, and travelling. The amounts of consumption on each category are measured as relative values with respect to household income. Consumption over income is a statistical device to measure household economic well-being (Meyer and Sullivan, 2011).

Table 3.3 Summary statistics for dependent variables

Dependent variables	Obs	Mean	Std. Dev	Min	Max	Zero values (%)
Part A: financial assets						
Cash/Financial assets	29,032	0.478	0.432	0	1	2.90%
Current deposits/Financial assets	29,032	0.312	0.372	0	1	43.12%
Time deposits/Financial assets	29,032	0.120	0.281	0	1	81.91%
Deposits (current and time)/Financial assets	29,032	0.432	0.412	0	1	37.97%
Liquid assets/Financial assets	29,032	0.910	0.231	0	1	0.40%
Stocks/Financial assets	29,032	0.012	0.083	0	1	95.82%
Bonds/Financial assets	29,032	0.002	0.035	0	1	99.41%
Funds/Financial assets	29,032	0.009	0.068	0	1	97.12%
Derivatives/Financial assets	29,032	0.000	0.013	0	0.990	99.94%
Financial management products/Financial assets	29,032	0.018	0.100	0	1	94.92%
Non-RMB financial assets/Financial assets	29,032	0.001	0.023	0	1	99.50%
Gold/Financial assets	29,032	0.001	0.027	0	1	99.41%
Lending/Financial assets	29,032	0.046	0.168	0	1	89.31%
Part B: household debt						
The log of housing debt	17,533	2.976	5.029	0	15.520	73.62%
The log of vehicle debt	26,669	0.245	1.505	0	13.122	96.85%
The log of education debt	15,501	0.703	2.518	0	14.691	92.64%
The log of credit card debt	15,708	0.489	2.022	0	13.710	94.23%
Part C: household consumption						
Consumption on food/Income	29,956	18.168	1221.793	0	171,428.578	0.47%
Housing consumption/Income	29,956	3.041	237.936	0	34,285.715	1.16%
Consumption on daily necessities/Income	29,956	1.415	100.168	0	13,714.286	2.71%
Consumption on family services/Income	29,956	0.030	3.315	0	571.429	93.43%
Consumption on transportation/Income	29,956	0.937	45.819	0	6,857.143	27.29%
Consumption on telecommunication/Income	29,956	3.295	360.417	0	60,342.859	2.88%
Consumption on entertainment/Income	29,956	0.057	3.176	0	480.000	76.03%
Consumption on clothing/Income	29,955	1.352	135.256	0	22,857.143	13.83%
Consumption on housing maintenance/Income	29,956	2.284	215.519	0	30,000.000	88.45%
Consumption on education/Income	29,956	1.955	140.132	0	22,857.143	57.48%
Consumption on travelling/Income	29,911	0.132	4.522	0	571.429	74.53%
Part D: household consumption (removing the top 2% outliers)						
Consumption on food/Income	29,366	0.832	1.362	0	12.000	0.48%
Housing consumption/Income	29,357	0.141	0.241	0	2.110	1.18%
Consumption on daily necessities/Income	29,367	0.079	0.146	0	1.200	2.76%
Consumption on family services/Income	29,357	0.001	0.004	0	0.047	95.34%
Consumption on transportation/Income	29,357	0.078	0.163	0	1.358	27.84%
Consumption on telecommunication/Income	29,357	0.091	0.155	0	1.384	2.94%
Consumption on entertainment/Income	29,357	0.005	0.014	0	0.115	77.58%
Consumption on clothing/Income	29,356	0.081	0.139	0	1.173	14.11%
Consumption on housing maintenance/Income	29,356	0.033	0.177	0	1.968	90.25%
Consumption on education/Income	29,357	0.127	0.340	0	2.892	58.65%
Consumption on travelling/Income	29,313	0.022	0.059	0	0.454	76.05%

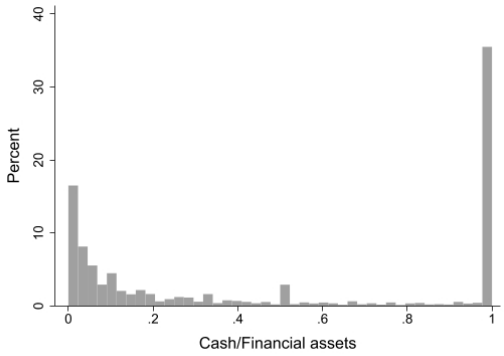
Note: The number of observations for each dependent variable is different because the number of missing values for each dependent variable varies.

Table 3.3 provides summary statistics of outcome variables. This table consists of four panels: Panel A pertains to financial assets, Panel B to household debt, and Panels C and D to household consumption. The first column displays the labels of dependent variables. The second column shows the number of non-missing observations for each variable. Therefore, the number of observations for each variable equals the total number of observations involved in this sample minus the number of observations with missing values. The number of observations differs because the number of missing values differs. The columns from the third to the sixth show the statistics of mean, standard deviation, minimum and maximum for each outcome variable. The last column displays the ratios of zero values with respect to the number of observations.

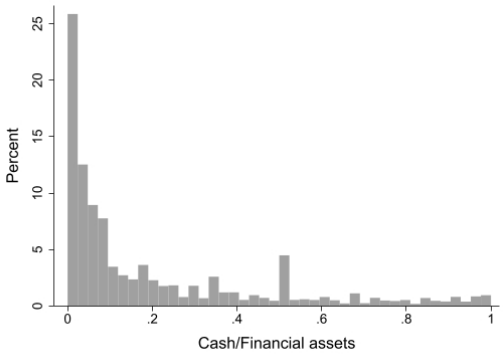
In Panel A, all asset variables have 29,032 observations. Considering that all asset variables are ratios over household total financial assets, the mean values reveal the average proportions of total financial assets invested in different asset categories. Looking at outcome variables related to liquid assets, households on average allocate 47.8% of household total assets in cash, 31.2% in current deposits, 12.0% in time deposits, 43.2% in total deposits (current and time), and 91.1% in liquid assets. This implies that most financial resources are allocated to liquid assets for Chinese households. In contrast, looking at risky assets, households on average invest 1.2% of household total assets in stocks, 1.8% in financial management products, and 4.6% in lending. Apart from these three risky assets, households on average have ratios less than 1% for bonds, funds, derivatives, non-RMB financial assets, and gold.

Figure 3.3 Distribution histograms of the ratios of each financial asset to total household financial assets

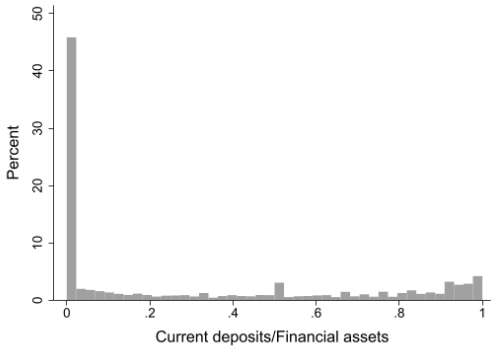
Cash/Financial assets



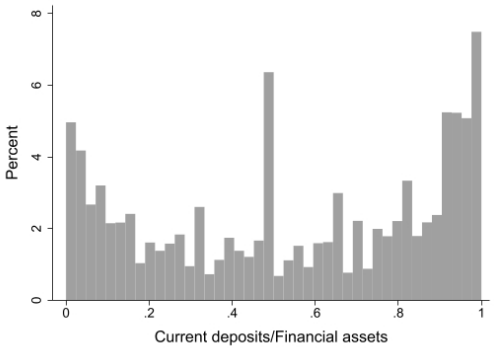
Cash/Financial assets (smaller than one)



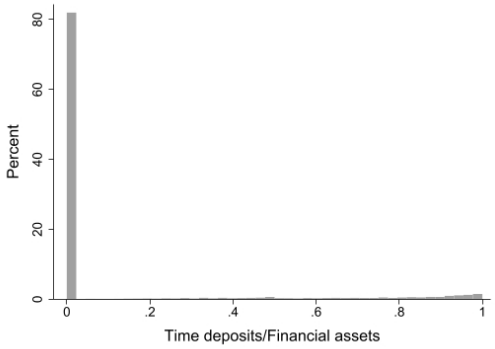
Current deposits/Financial assets



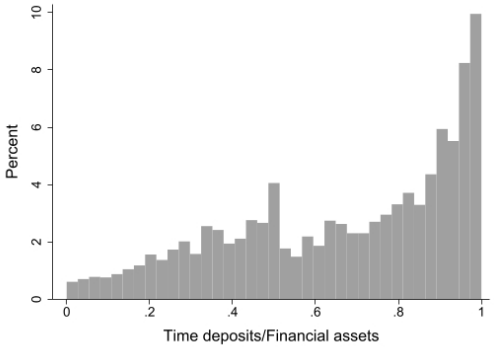
Current deposits/Financial assets (for positive values)



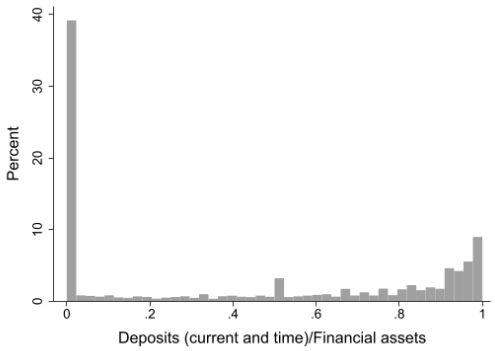
Time deposits/Financial assets



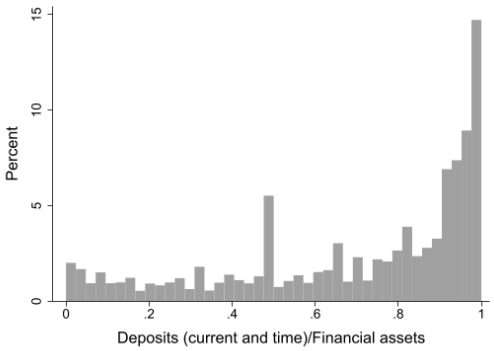
Time deposits/Financial assets (for positive values)



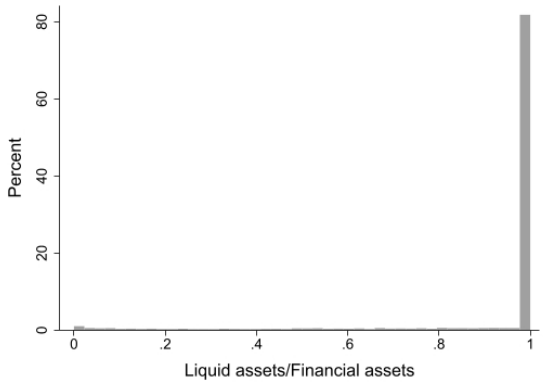
Deposits (current and time)/Financial assets



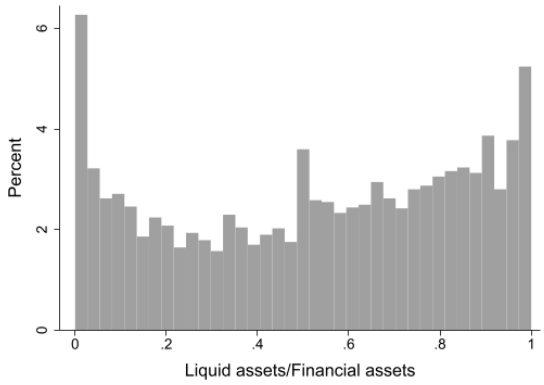
Deposits (current and time)/Financial assets (for positive values)



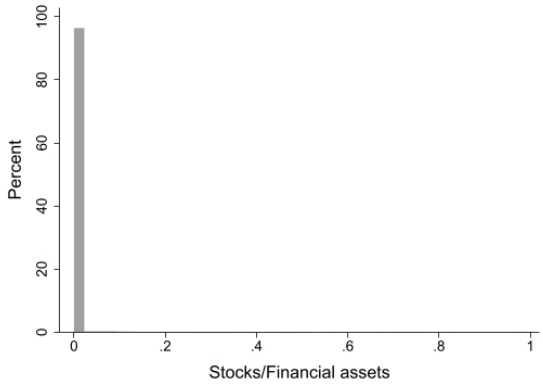
Liquid assets/Financial assets



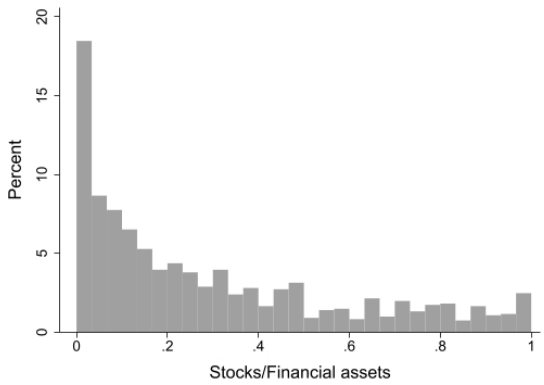
Liquid assets/Financial assets (smaller than one)



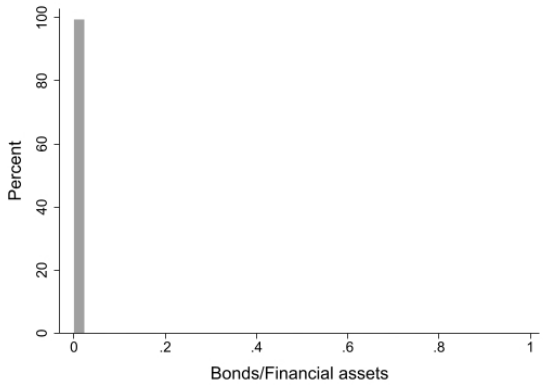
Stocks/Financial assets



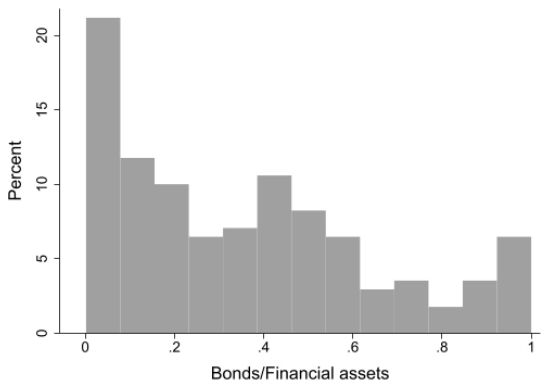
Stocks/Financial assets (for positive values)



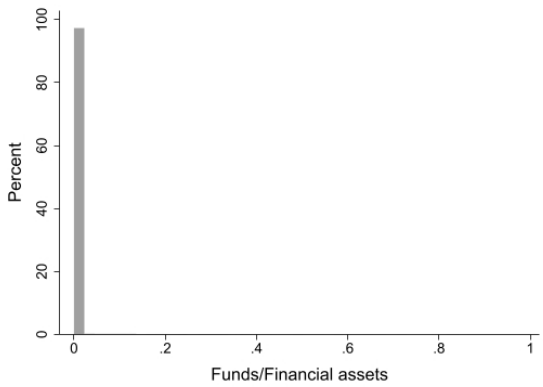
Bonds/Financial assets



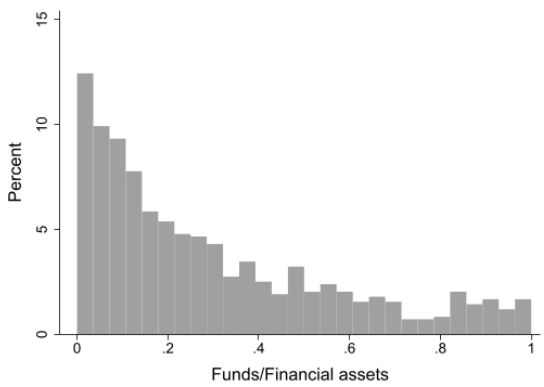
Bonds/Financial assets (for positive values)



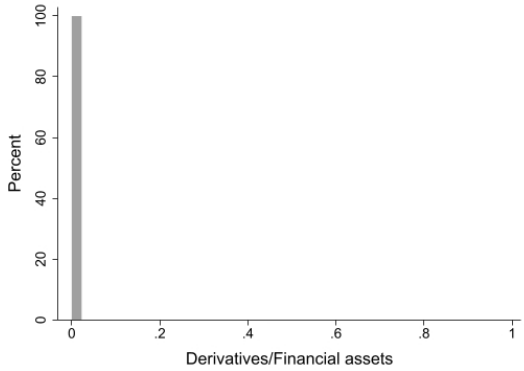
Funds/Financial assets



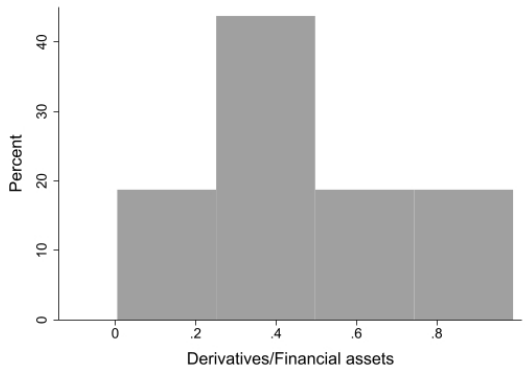
Funds/Financial assets (for positive values)



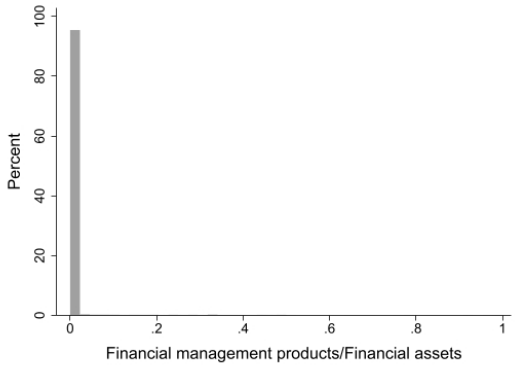
Derivatives/Financial assets



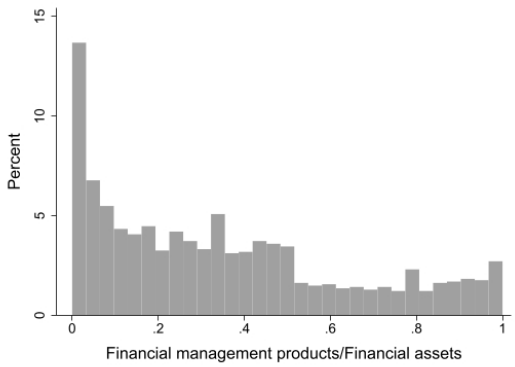
Derivatives/Financial assets (for positive values)



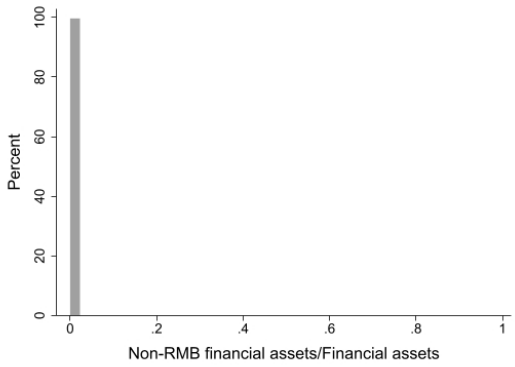
Financial management products/Financial assets



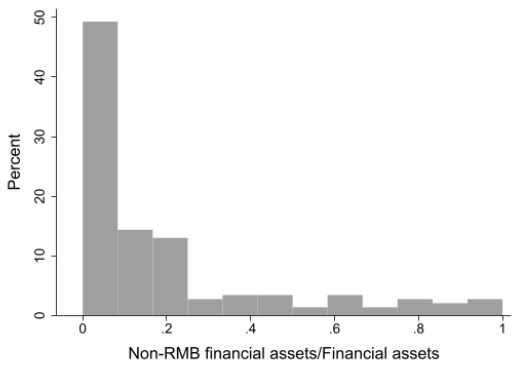
Financial management products/Financial assets (for positive values)



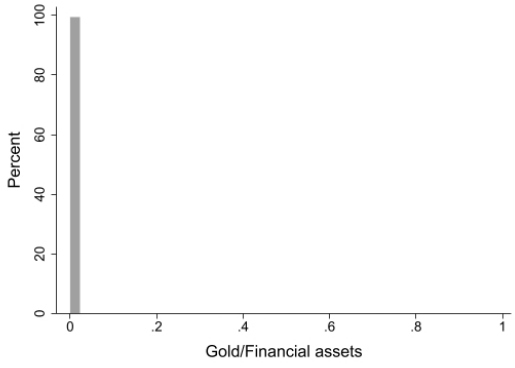
Non-RMB financial assets/Financial assets



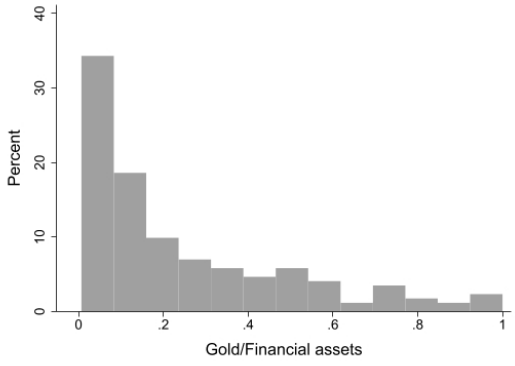
Non-RMB financial assets/Financial assets (for positive values)



Gold/Financial assets



Gold/Financial assets (for positive values)



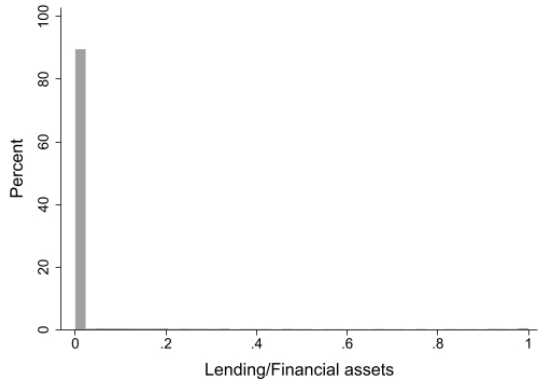
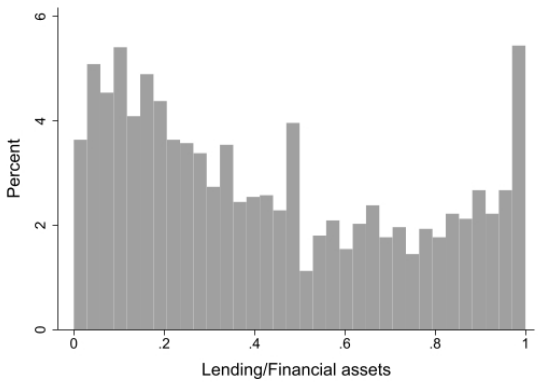
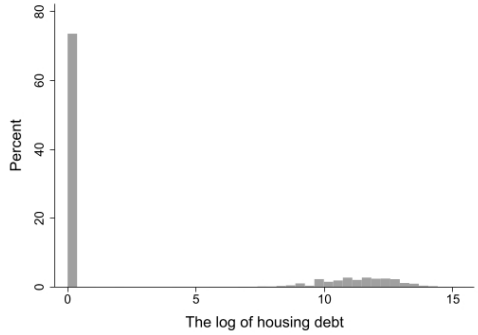
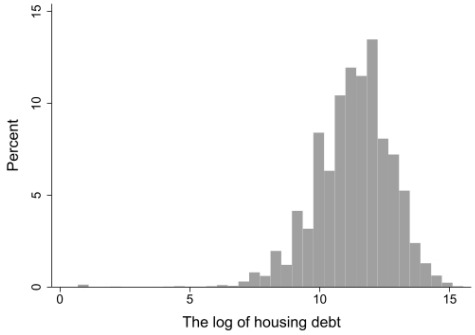
Lending/Financial assets	Lending/Financial assets (for positive values)
	

Figure 3.4 Distribution histograms of the logarithm of each debt category

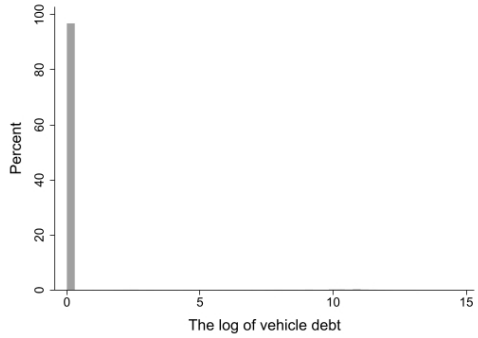
The log of housing debt



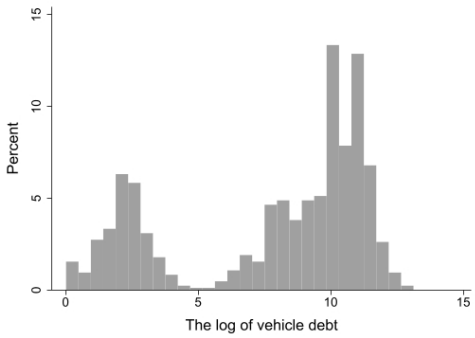
The log of housing debt (for positive values)



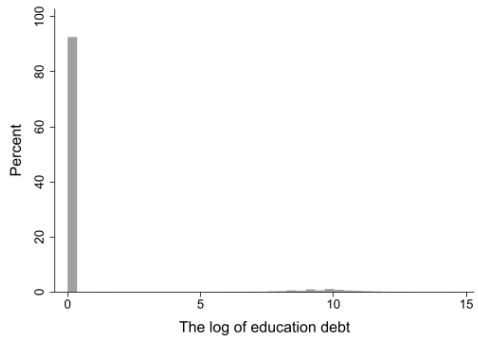
The log of vehicle debt



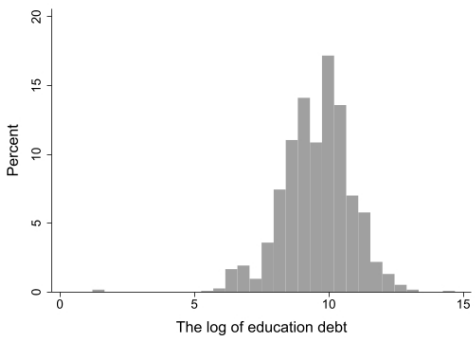
The log of vehicle debt (for positive values)



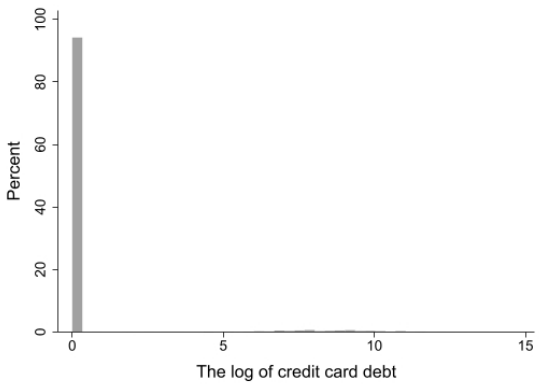
The log of education debt



The log of education debt (for positive values)



The log of credit card debt



The log of credit card debt (for positive values)

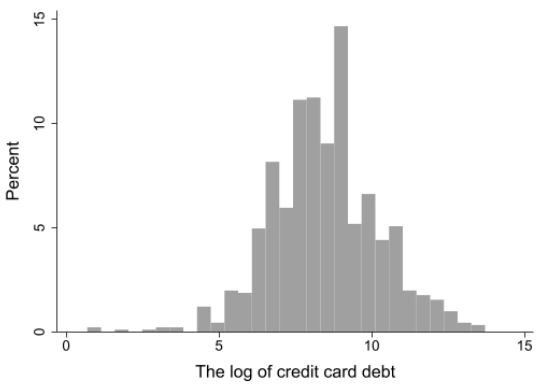
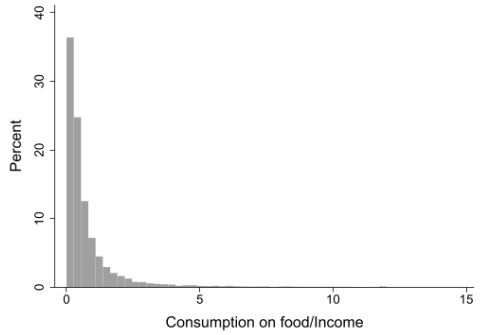
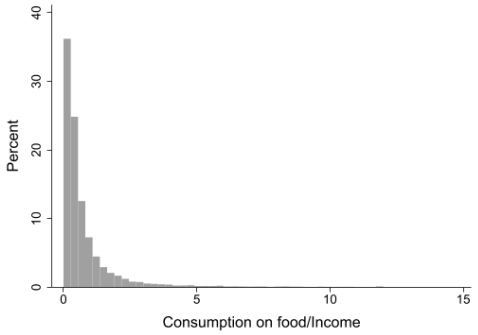


Figure 3.5 Distribution histograms of the ratios of each consumption category to household income (discarding values greater than 99th percentile)

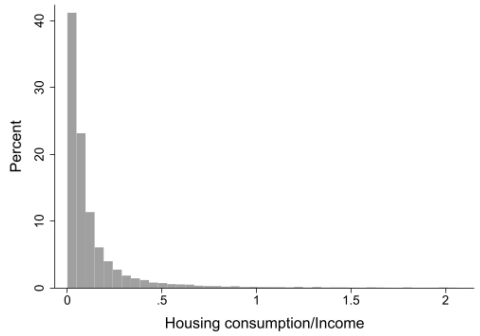
Consumption on food/Income



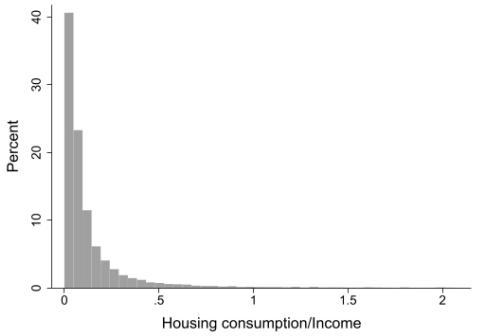
Consumption on food/Income (for positive values)



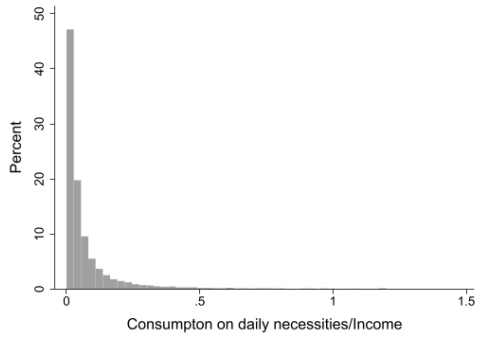
Housing consumption/Income



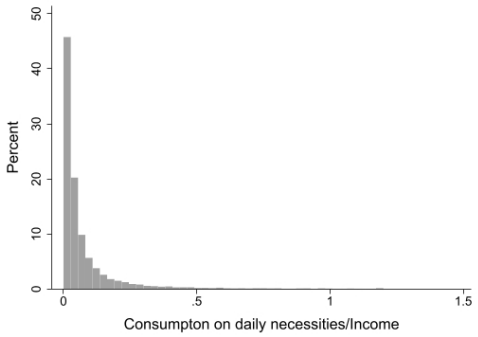
Housing consumption/Income (for positive values)



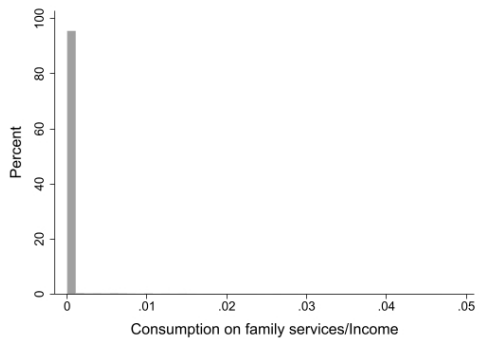
Consumption on daily necessities/Income



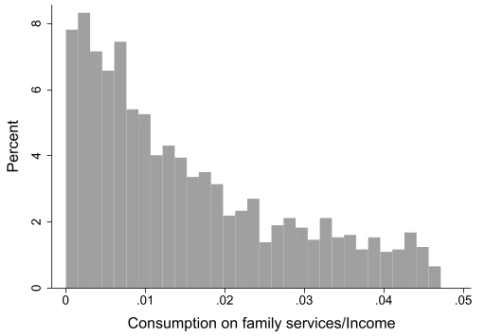
Consumption on daily necessities/Income (for positive values)



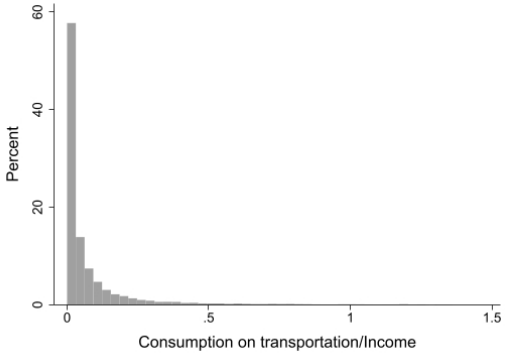
Consumption on family services/Income



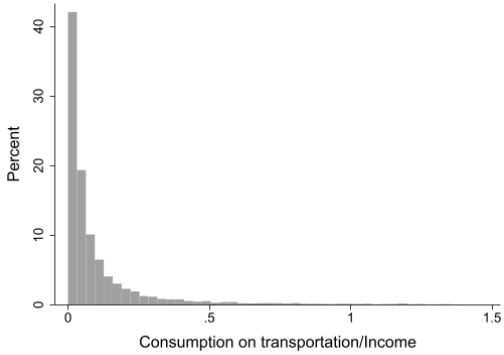
Consumption on family services/Income (for positive values)



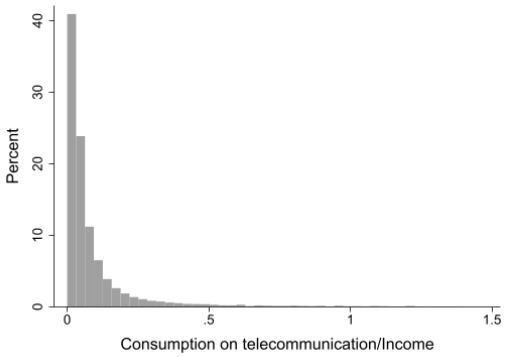
Consumption on transportation/Income



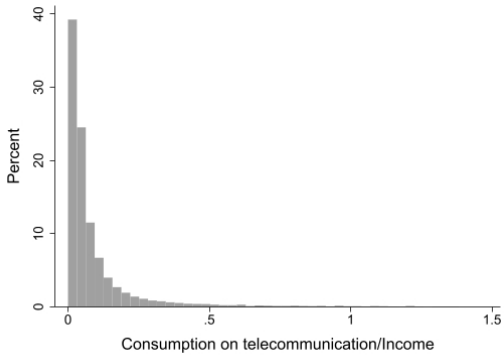
Consumption on transportation/Income (for positive values)



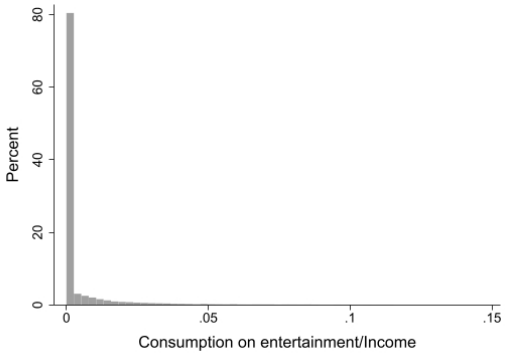
Consumption on telecommunication/Income



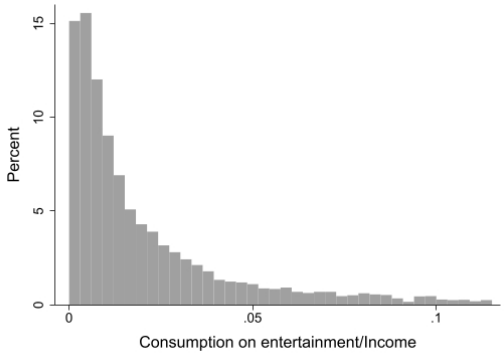
Consumption on telecommunication/Income (for positive values)



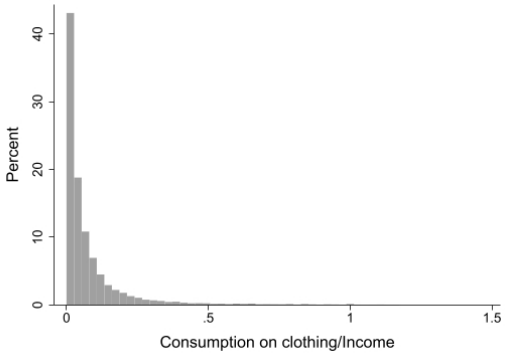
Consumption on entertainment/Income



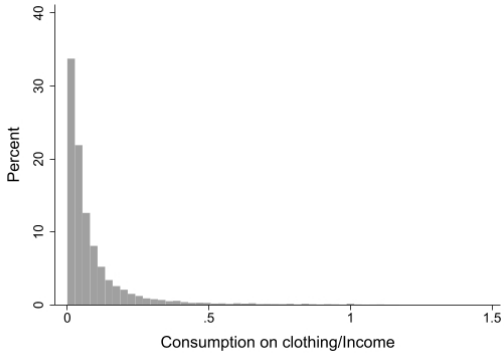
Consumption on entertainment/Income (for positive values)



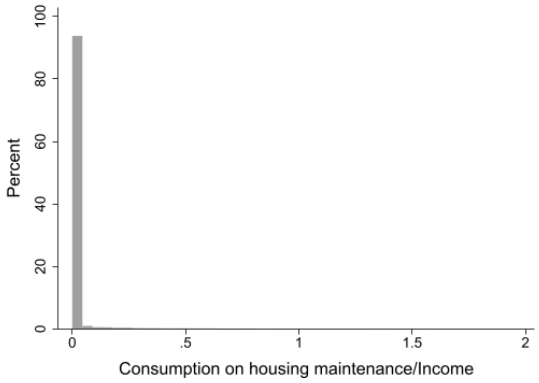
Consumption on clothing/Income



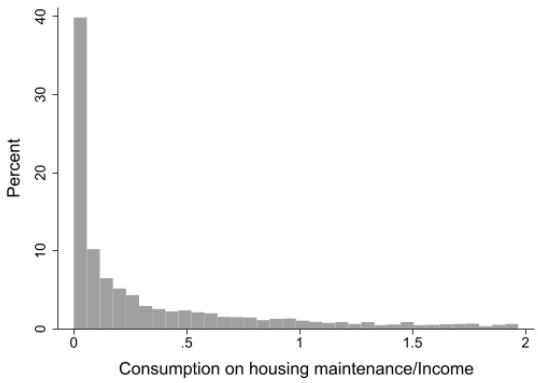
Consumption on clothing/Income (for positive values)



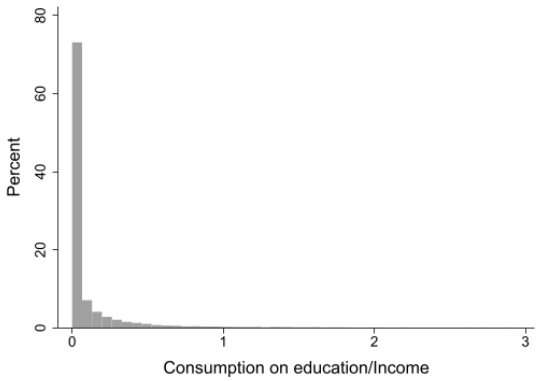
Consumption on housing maintenance/Income



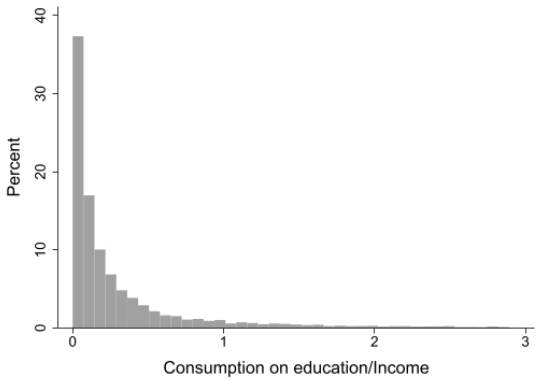
Consumption on housing maintenance/Income (for positive values)



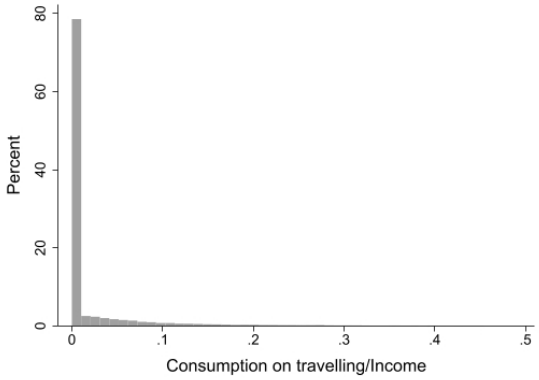
Consumption on education/Income



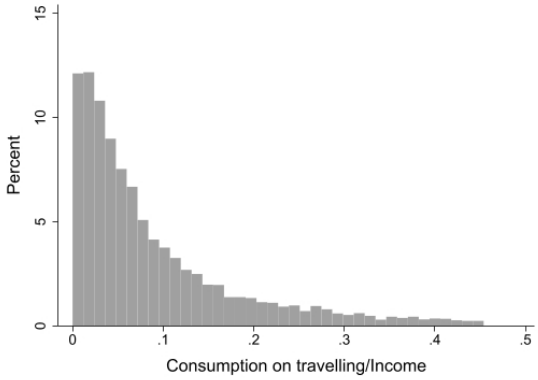
Consumption on education/Income (for positive values)



Consumption on travelling/Income



Consumption on travelling/Income (for positive values)



In Panel B of Table 3.3, the outcome variables regarding debt are the absolute amounts of the different debt categories in the logarithmic form. In Panel C and Panel D of this table, the summary statistics of consumption ratios with respect to income are reported. In the sixth column of Panel C, it is shown that the maximum values for the consumption ratios are extremely large. Take food/income as an example, the maximum value indicates that this household spends 171,428 times its income on food consumption, which is an obvious outlier. After summarising the consumption ratios and comparing the summary statistics between using the whole sample and using the right-trimmed sample at the 98th percentile, it is clear that the outliers greatly influence the magnitudes of estimates and thus disturb the analysis. Hence, a reasonable practice is to discard the top 2% outliers to trim the observations at the 98th percentile, to eliminate the impacts of outliers. As shown in Table 3.3, from Panel C to Panel D, the number of observations decreases by approximately 600. The trimmed sample is used to run the regressions with the consumption ratios as the dependent variables.

Following the summary statistics table, the histograms of dependent variables are displayed in Figure 3.3 for household financial assets, Figure 3.4 for household debt, and Figure 3.5 for household consumption. Combined with the proportions of zero values shown in the last column of Table 3.3, there are three types of dependent variables, continuous variables, limited variables censored at zero, and limited variables censored at one. Specifically, for liquid asset ratios to total financial assets, cash and liquid assets are censored at one, while current deposits, time deposits, and total deposits are censored at zero, as shown in Figure 3.3. For illiquid asset ratios to total financial assets, all illiquid asset ratios regarding stocks, bonds, funds, derivatives, financial management products, non-RMB financial assets, gold, and lending, are censored at zero, as shown in Figure 3.3. As shown in Figure 3.4, the debt variables are censored at zero. For consumption-to-income ratios, food consumption, housing consumption, consumption on daily necessities, and telecommunication consumption are continuous variables with no censoring patterns. In contrast, other consumption variables, for family services, transportation, entertainment, clothing, housing maintenance, education, and travelling, are censored at zero.

Table 3.4 Summary statistics for dependent variables by demolition group

Dependent variables	Mean values			Mean-comparison tests between the demolished group and the non-demolished group		
		Ever demolished?				
	Total	No	Yes	Difference	t value	p value
Part A: financial assets						
Cash/Financial assets	0.478	0.480	0.447	-0.033	-3.111	0.002
Current deposits/Financial assets	0.312	0.313	0.305	-0.008	-0.863	0.388
Time deposits/Financial assets	0.120	0.118	0.161	0.043	6.393	0.000
Deposits (current and time)/Financial assets	0.432	0.430	0.466	0.036	3.581	0.000
Liquid assets/Financial assets	0.910	0.910	0.913	0.003	0.557	0.578
Stocks/Financial assets	0.012	0.012	0.011	-0.002	-0.877	0.380
Bonds/Financial assets	0.002	0.002	0.002	0.000	0.409	0.682
Funds/Financial assets	0.009	0.009	0.009	0.000	0.173	0.862
Derivatives/Financial assets	0.000	0.000	0.000	-0.000	-0.787	0.432
Financial management products/Financial assets	0.018	0.017	0.024	0.007	2.730	0.006
Non-RMB financial assets/Financial assets	0.001	0.001	0.001	0.000	0.389	0.698
Gold/Financial assets	0.001	0.002	0.000	-0.001	-1.650	0.099
Lending/Financial assets	0.046	0.047	0.039	-0.007	-1.834	0.067
Part B: household debt						
The log of housing debt	2.976	3.008	2.456	-0.552	-3.421	0.001
The log of vehicle debt	0.245	0.247	0.213	-0.034	-0.867	0.386
The log of education debt	0.703	0.710	0.593	-0.117	-1.385	0.166
The log of credit card debt	0.489	0.490	0.474	-0.016	-0.245	0.806
Part C: household consumption (removing the top 2% outliers)						
Consumption on food/Income	0.832	0.832	0.824	-0.009	-0.258	0.796
Housing consumption/Income	0.141	0.141	0.138	-0.003	-0.479	0.632
Consumption on daily necessities/Income	0.079	0.080	0.074	-0.006	-1.631	0.103
Consumption on family services/Income	0.001	0.001	0.001	0.000	3.663	0.000
Consumption on transportation/Income	0.078	0.078	0.075	-0.003	-0.746	0.456
Consumption on telecommunication/Income	0.091	0.091	0.082	-0.009	-2.294	0.022
Consumption on entertainment/Income	0.005	0.005	0.005	0.001	1.866	0.062
Consumption on clothing/Income	0.081	0.081	0.075	-0.006	-1.790	0.073
Consumption on housing maintenance/Income	0.033	0.033	0.038	0.005	1.272	0.204
Consumption on education/Income	0.127	0.129	0.107	-0.022	-2.662	0.008
Consumption on travelling/Income	0.022	0.022	0.020	-0.001	-0.916	0.360

Note: The number of observations for each dependent variable is different because the number of missing values for each dependent variable varies.

To compare the treatment group of demolished households and the control group of non-demolished households, Table 3.4 shows the results of comparison tests between the two groups. The first column lists the labels of dependent variables. Columns 2 to 4 present the average value of each dependent variable for all households, non-demolished households, and demolished households separately. In the fifth column, the difference is between the mean values of demolished households and non-demolished households, with the corresponding t values and p values followed in the sixth and seventh columns indicating the significance.

For asset variables, as shown in Part A of Table 3.4, demolished households significantly have a smaller share in the holdings of cash at 1% level, a smaller share in the holdings of gold and lending at 10% level, and a larger share in the holdings of time deposit, total deposits, and financial management products at 1% level. Apart from these six asset variables, no significant difference is detected for the asset ratios with respect to household total financial assets regarding current deposits, liquid assets, stocks, bonds, funds, derivatives, and non-RMB financial assets. For household debt, only the difference in the amounts of housing debt in the logarithmic form is statistically significant at 1% level, which is -0.552, indicating that demolished households on average have lower housing debt than non-demolished households. There are no significant differences in the holdings of vehicle debt, education debt and credit card debt.

For household consumption, demolished households on average spend a higher ratio (0.000) of household income in consumption on family services at 1% level, a higher ratio (0.001) of household income in entertainment consumption at 10% level, a low proportion (-0.022) in education consumption at 1% level, a lower proportion (-0.009) in telecommunication consumption at 5% level, a lower proportion (-0.006) in clothing consumption at 10% level. In contrast, no significant difference between demolished households and non-demolished households is found in the consumption-to-income ratios regarding food, housing, daily necessities, transportation, housing maintenance, and travelling.

3.3.3 Independent variables

There are four key explanatory variables in the regression analysis of this chapter: the treatment variable, the time variable, risk attitudes, and financial literacy. First, concerning the demolition variable, a 0/1 dummy variable indicates whether the household experienced a housing demolition between 2013 and 2017, equalling 1 if yes and 0 otherwise. That is, the treatment variable equals 1 for households in the treatment group and 0 for households in the control group. Secondly, a binary variable is defined as equal to 1 if the observation belongs to the 2017 wave, after the treatment of housing demolitions, and 0 if the observation belongs to the 2013 wave, before the treatment.

In the 2017 wave, financial literacy and risk attitudes questions are exclusively asked for new respondents, and in the process of constructing panel data, only old respondents are kept in the panel data. Therefore, the information in relation to financial literacy and risk attitudes is missing for the observations belonging to the 2017 wave. To address this problem, this chapter imputes the missing values of risk attitudes and financial literacy using the risk attitudes and the financial literacy scores of the 2015 wave, assuming that risk attitudes and financial literacy are time-invariant from 2015 to 2017, following Li (2021). That is, the financial literacy scores of the observations belonging to the 2017 wave are equal to their own financial literacy scores reported in the 2015 wave. Meanwhile, households' risk attitudes in the 2017 wave are equal to their reported risk attitudes in the 2015 wave. The description of questions in relation to risk attitudes and financial literacy is shown in Appendix 3.1.

Third, the risk attitude variable is derived from the attitude question about respondents' preferences when having funds to invest. The respondents make a decision among five types of projects: (1) projects with high risks and high returns, (2) projects with relatively high risks and relatively high returns, (3) projects with average risks and average returns, (4) projects with low risks and low returns and (5) projects without any risk. The answers indicate respondents' risk attitudes. This chapter combines the respondents choosing the first and second options.

Therefore, from the perspective of households' risk attitudes, all respondents can be divided into four groups. The first group includes households choosing the first and second options, preferring projects with high risks and high returns. The second group contains households choosing the third option of risk attitudes questions, preferring investing in projects with average risks and average returns. The third group comprises households who are willing to invest in low-risk projects with low returns, indicating higher risk aversion compared with the previous two groups. The fourth group is the no-risk group with households who are not willing to take any risks when making investment decisions. In the empirical analysis, three dummies are generated for three risky groups, with the no-risk group acting as the reference group. The details related to these three dummies are discussed in the empirical strategies section.

Fourth, the financial literacy variable reflects the answers to three literacy questions with the purpose of examining the respondents' knowledge of interest rates, inflation risks, and risks of different financial assets. As shown in Appendix 3.1, there are three questions designed to capture households' financial literacy. The first financial literacy question asks respondents to calculate the sum of principals and interests after depositing a certain amount of money in the bank after a given period. It tests households' understanding of the time value of money and their numeracy ability. The second financial literacy question provides both an interest rate and an inflation rate, then collects households' answers relating to the purchasing power of money after a certain period. The third financial literacy question asks respondents to choose the risker financial assets between stocks and funds, testing their understanding of risk diversification. Based on the answers to these three survey questions related to financial literacy, the values of the financial literacy variable equal the number of correct answers to the three financial literacy questions, ranging from 0 to 3. For example, if respondents correctly answer all questions, the financial literacy variable equals 3, while it equals zero if all answers to these three questions are incorrect.

Table 3.5 Details of the explanatory variables

Explanatory variables	*Description*
Treatment dummy	A dummy variable. 1 if the household experienced at least one housing demolition between 2013 and 2017; 0, otherwise. That is, these variable equals 1 if the observation belongs to the treatment group and 0 if the observation belongs to the control group in the quasi-experiment.
Time dummy	A dummy variable. 1 if the observation belongs to the 2017 wave and 0 if the observation belongs to the 2013 wave.
The interaction term between the treatment dummy and the time dummy	An interaction term of the treatment dummy variable and the time dummy variable.
Risk attitudes	A set of dummy variables indicating the respondents' risk attitudes: [1] Prefer projects with high risks and high returns; [2] Prefer projects with average risks and average returns; [3] Prefer projects with low risks and low returns; and [4] Prefer projects with no risk. In the empirical analysis, there are three risk attitudes variables ($Risk_{it}^{1}$, $Risk_{it}^{2}$, and $Risk_{it}^{3}$). $Risk_{it}^{1}$ equals 1 if the economic respondent chooses the low returns and low risks projects when making investment decisions and 0 otherwise. $Risk_{it}^{2}$ equals 1 if the economic respondent is interested in the average returns and average risks projects and 0 otherwise. $Risk_{it}^{3}$ equals 1 if the economic respondent prefers the projects with high returns and high risks and 0 otherwise. The no-risk group is the reference group.
Financial literacy	The financial literacy score is derived from the answers of three attitudinal questions: one for interest rates, one for inflation rates and one for comparing the risks of two different financial assets (stocks and funds). Add one score to the financial literacy index if the respondent answers one question correctly.
The log of household total income	The logarithm of household total income.
The share of young household members	The number of young household members, whose age is equal to and smaller than 16, divided by the number of household members (household size).
The share of old household members	The number of old household members, whose age is equal to and greater than 65, divided by the number of household members (household size).
The characteristics of household economic respondents	
Age	The age of the household economic respondent.
Age^2	(The age of the household economic respondent)^2.
Female	A dummy variable. 1 if the household economic respondent is female; 0, otherwise.
Attended school	A dummy variable. 1 if the household economic respondent ever attended school; 0 otherwise.
Having a degree	A dummy variable. 1 if the household economic respondent has a degree; 0 otherwise.
Employment status	A dummy variable with 1 = employed and o otherwise.
Bad health	A dummy variable with 1 if the household economic respondent has bad health status and 0 if the household economic respondent does not have bad health status.
Hukou	A dummy variable. 1 if the household economic respondent has an agricultural hukou and 0 if the household economic respondent does not have an agricultural hukou.
Marital status	A dummy variable with 1 = married and 0 = unmarried.
Minority	A dummy variable. 1 if the household economic respondent belongs to ethnic minorities, not the ethnic Han; 0 otherwise.
Party membership	A dummy variable. 1 if the household economic respondent is a member of the Communist Party of China (CPC); 0 otherwise.

In this chapter, household characteristics and some features of household economic respondents are key covariates; by including these variables, it will be clear the impacts of household characteristics after housing demolitions. Details concerning other explanatory variables are provided in Table 3.5. Apart from the four main explanatory variables, this chapter also controls household income, household young dependency ratios, household old dependency ratios, and the socio-demographic characteristics of household economic respondents. These socio-demographic controls include age (and its square), gender, education (whether economic respondents ever attended school and whether they have a degree), employment status, health status (with bad health or not), hukou status (agricultural or non-agricultural), marriage (married or not), ethnicity (belonging to ethnic minorities or not), and party membership (a member of the Communist Party of China or not). Apart from the age and squared age variables, the remaining socio-demographic controls are dummy variables.

The summary statistics for independent variables are shown in Table 3.6. The second column displays the number of observations for each variable. The third column displays the mean values of independent variables. For the treatment dummy, the mean value is equal to 0.062, indicating that 6.2% of households are categorised into the treatment group. The average financial literacy scores are 0.732, indicating that Chinese residents on average fail to give at least one correct answer to the financial literacy questions. The average dependence ratio for older people is 0.205, showing that on average around one-fifth of household members are older people. The average dependency ratio for young people is 0.128, showing that on average 12.8% of household members are young people.

Look at the demographic characteristics of the economic respondent. The average age of the economic respondents is approximately 53. Among all economic respondents, 45.4% are female; 83.1% attended school; 5.7% have at least a degree; 62.8% are employed; 40.5% are reported to have bad health status; 61.1% have an agricultural hukou (a national identity administrative system); 86.1% are married; 6.9% belong to the ethnic minority; and 15.8% are a member of the Chinese Communist Party.

Table 3.6 Summary statistics for independent variables

Independent variables	Obs	Mean	Std. Dev	Min	Max
Treatment dummy (1 if demolished and 0 otherwise)	30,652	0.062	0.241	0	1
Time dummy (1 if the observation belongs to the wave 2017 and 0 if 2013)	30,652	0.500	0.500	0	1
The interaction term between the treatment dummy and the time dummy	30,652	0.031	0.173	0	1
Financial literacy scores	30,652	0.732	0.850	0	3
Risk attitudes	30,652	1.817	1.039	0	4
The log of household income	30,652	10.198	2.063	0	15.649
Quintile position of household income	30,652	3.003	1.414	1	5
Old dependency ratio	30,652	0.205	0.336	0	1
Young dependency ratio	30,652	0.128	0.167	0	0.833
Age	30,652	53.442	14.072	4	113
Squared age divided by 100	30,652	30.541	15.148	0.160	127.690
Female	30,652	0.454	0.498	0	1
Attended school	30,652	0.831	0.375	0	1
Having a degree	30,652	0.057	0.232	0	1
Employment status	30,652	0.628	0.483	0	1
Bad health dummy	30,652	0.405	0.491	0	1
Hukou status	30,652	0.616	0.486	0	1
Marital status	30,652	0.861	0.346	0	1
Minority	30,652	0.069	0.253	0	1
Party membership	30,652	0.158	0.364	0	1

Table 3.7 Summary statistics of independent variables by demolition group

Independent variables	Mean values			Mean-comparison tests between the demolished group and the non-demolished group		
		Ever demolished?				
	Total	No	Yes	difference	t value	p value
Frequency	*30,652*	*28,756*	*1,896*			
Treatment dummy (1 if demolished and 0 otherwise)	0.062	0.000	1.000	1.000		.
The time dummy (1 if the observation belongs to the wave 2017 and 0 if 2013)	0.500	0.500	0.500	0.000	0.000	1.000
The interaction term between the treatment dummy and the time dummy	0.031	0.000	0.500	0.500	169.570	0.000
Financial literacy scores	0.732	0.729	0.774	0.045	2.249	0.025
Risk attitudes	1.817	1.823	1.722	-0.101	-4.108	0.000
The log of household income	10.198	10.183	10.425	0.242	4.94	0.000
Quintile position of household income	3.003	2.990	3.204	0.214	6.376	0.000
Old dependency ratio	0.205	0.204	0.222	0.018	2.259	0.024
Young dependency ratio	0.128	0.129	0.104	-0.025	-6.299	0.000
Age	53.442	53.357	54.730	1.373	4.115	0.000
Squared age divided by 100	30.541	30.448	31.955	1.507	4.197	0.000
Female	0.454	0.451	0.503	0.053	4.458	0.000
Attended school	0.831	0.828	0.868	0.040	4.474	0.000
Having a degree	0.057	0.058	0.042	-0.016	-2.967	0.003
Employment status	0.628	0.636	0.505	-0.131	-11.447	0.000
Bad health dummy	0.405	0.406	0.392	-0.014	-1.190	0.234
Hukou status	0.616	0.628	0.434	-0.194	-16.858	0.000
Marital status	0.861	0.863	0.828	-0.036	-4.363	0.000
Minority	0.069	0.070	0.054	-0.016	-2.692	0.007
Party membership	0.158	0.157	0.159	0.001	0.154	0.878

The mean-comparison tests are also conducted for the independent variables, as shown in Table 3.7. The first column displays the labels of independent variables. The following three columns, from the second column to the fourth column, display the average values of each independent variable for all households, non-demolished households, and demolished households respectively. The results of the comparison tests between the mean values of the independent variables for demolished households and the mean values for non-demolished households are shown in Table 3.7, with the difference shown in the fifth column, the t value in the sixth column and the p value in the seventh column.

The difference for the treatment variable is one, because all values of the treatment variable in the treatment group are one and all values in the control group are zero. Therefore, there is no variance in each group, without *t* value and *p* value reported in the table. The difference of the time dummy is zero, because the data used in this chapter are balanced, with half of observations before the treatment and half of observations after the treatment for both the treatment group and the control group. For financial literacy scores, demolished households on average have a higher score of 0.045 than non-demolished households at 5% significant level. For household income, demolished households on average have higher income levels than non-demolished households. The income difference in the logarithmic form is significant at 1% level. Looking at the demographic characteristics of the economic respondents, apart from the health status and the party membership, there are significant differences at 1% significance level between demolished households and non-demolished households.

3.4 Empirical Analyses

This chapter presents models that analyse the distribution of various assets within total household financial assets, the logarithm of four distinct debt categories (housing, vehicle, education, and credit), and the proportions of different consumption types in relation to total household income. In particular, the assets include cash, current deposits, time deposits, both deposits (current and time), liquid assets (cash and deposits), stocks, bonds, funds, derivatives, financial management products, non-RMB financial assets, gold, and lending. The consumption types include food, housing, daily necessities, family services, transportation, telecommunication, entertainment, clothing, housing maintenance, education, and travelling.

The ratios of household assets, which indicate the allocation of financial assets within households, and the logarithm of debt values are treated as censored outcomes. There are two distribution patterns for household consumption: censored or continuous. There are four continuous consumption ratios with respect to household income, including consumption-to-income ratios for food, housing, daily necessities, and telecommunication. The remaining seven consumption-to-income ratios (regarding family services, transportation, entertainment, clothing, housing maintenance, education, and travelling) are censored outcomes. This chapter adopts a random effects Tobit model for censored outcomes using panel data and a random effects Generalised Least Squares (GLS) method for continuous outcomes.

3.4.1 Empirical strategies

Following the existing literature exploring the relationship between housing demolition and household financial and consumption decisions, housing demolition events in the context of China are employed as a natural experiment, with the demolitions being the treatment (Cai *et al.*, 2018; Zhou, 2018; Shi and He, 2022; Wang *et al.*, 2023). The quasi-natural experiment effectively addresses the endogeneity problem mainly due to the self-selection of households, because the random and exogenous treatment (housing demolitions) causes an unexpected wealth shock but is unrelated to unobserved factors influencing household financial and consumption decisions. In the quasi-experimental settings, housing demolitions are the treatment, and non-demolished households (the control group) are the counterfactuals of demolished households.

When housing demolitions act as exogenous shocks, this chapter employs a difference-in-difference methodology to study the effect of housing demolitions. This is achieved by comparing the within-household differences, before and after housing demolitions, between the demolished households and other households. This chapter employs the following regression equation:

$$Y_{it} = \beta_0 + \beta_1 \mathrm{Treatment}_{it} + \beta_2 \mathrm{Time}_{it} + \beta_3 (\mathrm{Treatment}_{it} \times \mathrm{Time}_{it}) + \lambda_1 \mathrm{Risk}_{it}^1 + \lambda_2 \mathrm{Risk}_{it}^2 + \lambda_3 \mathrm{Risk}_{it}^3 + \beta_4 \mathrm{FL}_{it} + \boldsymbol{\gamma} \boldsymbol{X}_{it} + \boldsymbol{\mu_i} + \varepsilon_{it} \quad (3.1)$$

In the equation above, Y_{it} indicates the outcome variable of the household i in the observation year t. There are four main types of 0/1 dummy variables, the treatment dummy ($\mathrm{Treatment}_{it}$), the time dummy (Time_{it}), the risk attitudes dummies (Risk_{it}^1, Risk_{it}^2, and Risk_{it}^3) and the financial literacy dummy (FL_{it}). $\mathrm{Treatment}_{it}$ equals to 1 if the household i in the year t ever experienced at least one housing demolition over the specified period between 2013 and 2017 and 0 otherwise. Time_{it} equals 1

if the household is affiliated to the year 2017 group (after the demolition) and 0 if the household appears in the 2013 wave (before the demolition).

Furthermore, Risk_{it}^{1}, Risk_{it}^{2}, and Risk_{it}^{3} indicate the risk attitudes of the respondent toward the risks and returns of financial projects. Risk_{it}^{1} equals 1 if the economic respondent chooses the low returns and low risks projects when making investment decisions, belonging to the high risk-aversion group, and 0 otherwise. Risk_{it}^{2} equals 1 if the economic respondent is interested in the average returns and average risks projects, belonging to the medium risk-aversion group, and 0 otherwise. Risk_{it}^{3} equals 1 if the economic respondent prefers the projects with high returns and high risks, belonging to the low risk-aversion group, and 0 otherwise. The inclusion of these three risk attitude dummies assumes that the no risk group, preferring no-risk investment choices, is set to be the reference group.

FL_{it} indicates the financial literacy of the respondent where a higher value denotes greater financial literacy. The values of the financial literacy variable equal the number of correct answers of three financial literacy questions related to interest rates, inflation rates and risk diversification, ranging from zero to three. The zero value means that the economic respondent does not provide any correct answer, and the value of three indicates that the respondent answers all financial literacy questions correctly. The covariate vector $\boldsymbol{X_{ijt}}$ represents a set of control variables (see Section 3.3 for details). Besides, βs and λs are the coefficients, and $\boldsymbol{\gamma}$ are the coefficient vector. $\boldsymbol{\mu_i}$ is a vector containing household fixed effects. ε_{ijt} stands for the error term.

Regarding the outcome variables used in this chapter, there are three main categories – the asset category, the debt category and the consumption category. First, the asset category includes the shares of each asset in total household financial assets. From the distribution diagrams shown in Figure 3.3, there are clear spikes for all asset ratios to total household financial assets. In detail, for the cash ratios and the liquid ratios, there are obvious right spikes at the value of one, indicating that there are a significant part of households only holding cash or liquid assets. Comparatively, for the current deposit

ratios, the time deposit ratios, the deposit (current and time) ratios, the stock ratios, the bond ratios, the fund ratios, the derivative ratios, the financial management products ratios, the non-RMB financial assets ratios and the precious metal ratios, there are noticeable left spikes at the value of zero, indicating that there is an obvious proportion of households not holding any current deposits, time deposits, deposits, stocks, bonds, funds, derivatives, financial management products, non-RMB financial assets, or precious metal. The former two outcome variables are censored at one, while the latter eleven variables are censored at zero. Therefore, random effects Tobit models are used to deal with both the lower censoring variables and the upper censoring variables. [27]

Second, the debt outcomes are the logarithm of four debt categories – housing debt, vehicle debt, education debt and credit card debt. As seen in Table 3.3, the proportions of zero values of these four debt variables are 73.62%, 96.85%, 92.64% and 94.23% respectively. Graphically, from the distribution histograms of the logarithm of each debt variable shown in Figure 3.4, the debt distributions are left-censored, with noticeable left spikes at the value of zero. To account for the high proportion of households not holding any household debt, random effects Tobit models are fitted to address the lowering censoring dependent variables.

Third, the consumption outcomes used in this chapter are consumption ratios calculated by dividing the monetary amounts of different consumption types by annual household income. There are eleven consumption types, including consumption on food, housing (e.g., bills and management fees), daily necessities, family services, transportation, telecommunication, entertainment, clothing, housing maintenance, education and travelling. Among these dependent variables of consumption, the food consumption ratios, the housing consumption ratios, the consumption ratios of daily necessities, and

[27] All these financial asset ratios are, in nature, ranging from 0 to 1. That is, for financial asset ratios between a specific asset and total financial assets, there is a lower bound of zero (not holding this asset category) and an upper bound of one (indicating that households only hold the specific financial asset). When using Stata to estimate the coefficients for financial asset regressions, both the lower limit and upper limit options are used to generate the estimation results. However, there are two exceptions, the ratios between non-RMB financial assets and household total assets and the ratios between gold and household total financial assets. The reason for only controlling the lower limit of zero is that Stata reports error messages of *initial values not feasible* for these two outcomes.

the consumption ratios of telecommunication are continuous (see Figure 3.5), with only a small proportion of observations having zero values (see Figure 3.3). The other consumption outcomes are censored at the lower zero with obvious spikes on the left in the distribution histograms (see Figure 3.5). The left spikes suggest that there are a proportion of households not spending any money on family services, transportation, entertainment, clothing, housing maintenance, education and travelling.

Overall, two econometric methods are used in this chapter. The random effects GLS approaches are adopted for four continuous consumption outcomes, and random effects Tobit models are fitted for all asset and debt outcomes and the remaining seven censored consumption outcomes.[28] In each of the Tobit models estimated, there are two essential perspectives to explain the relationship between the interaction term (of housing demolitions and year) and the outcome of interest: the likelihood of deviating from the upper or lower limit (the marginal effects at the extensive margins), and the magnitude of the effect of housing demolitions on outcomes given the deviation from the censoring limits (the marginal effects at the intensive margins).

The focus of this chapter is the coefficients of the interaction term, β_3, the difference-in-difference coefficient (also called the double difference estimate). The difference-in-difference framework is used to estimate the effect of housing demolitions on household financial and consumption decisions by comparing the changes in outcomes of interest over time between the treatment group and the control group. In this way, this chapter explores how the affected households react to the exogenous wealth shocks. The parallel trend assumption of the difference-in-difference strategy states that without housing demolitions, the differences between the demolished households (the treatment group) and the non-demolished households (the control group) are constant over time. When the double difference

[28] As with Chapter 2, this chapter assumes that there is not a separate mechanism forcing the formation of boundaries at the ends, zero or one, when response variables are bounded. This chapter addresses the bounded distribution of dependent variables using Tobit models. However, other methods are worth considering. For example, when exploring the composition of financial assets, multinomial fractional models are another choice given that response variables are fractions of multiple choices.

estimate is statistically significant, it verifies that housing demolitions play a role in determining the outcomes after housing demolitions.

The purpose of this chapter is to estimate the medium-term effects of housing demolitions on household financial and consumption decisions. For Tobit models, this chapter displays the estimation results of beta coefficients for all independent variables and then the average marginal effects of the treatment variable, the time variable and their interaction term at both the extensive and the intensive margins. The beta coefficients of Tobit models measure the relationship between explanatory variables and unobserved dependent variables, *ceteris paribus*, which are the responses of the unobserved dependent variables in response to the change of each explanatory variable.[29]

For brevity, this chapter does not display the marginal effects at the extensive margins and the intensive margins for financial literacy, risk attitudes and other covariates in the main body. Full details regarding the marginal effect at the extensive and intensive margins are shown in Appendix 3.2 to Appendix 3.9. The focus of this chapter is the effect of housing demolitions on household financial and consumption outcomes through exploring the coefficients of the interaction term, along with the inter-group comparison from the coefficients of the treatment variable and the over-time comparison from the coefficients of the post-treatment indicator. The marginal effects at the extensive margins measure the responses of the probability of being uncensored with respect to each regressor, while the marginal effects at the intensive margins describe, conditional on being uncensored, how the dependent variables change with respect to the changes of explanatory variables, *ceteris paribus*.

3.4.2 Empirical results for household assets

[29] From the official manual documents of Stata related to the `tobit` and `xttobit` commands, the Stata-reported coefficients for the latent regression models can be interpreted in a way similar to the linear regression models. The coefficients reveal the changes in the expected uncensored dependent variables in response to the changes in explanatory variables. Details can be found via these two links, https://www.stata.com/manuals/xtxttobit.pdf and https://www.stata.com/manuals/rtobit.pdf. Also, see https://www.stata.com/manuals13/rtobitpostestimation.pdf for the description of Tobit-related post-estimation commands.

The regression results for household financial asset allocation, with the shares of different financial assets that households hold as the dependent variables, are divided into two parts. The first part includes the estimation results of the liquid financial assets, and the second part is for the illiquid financial assets. Table 3.8 shows the random effects Tobit estimation results for the determinants of household liquid financial asset composition (the proportion of each liquid financial asset with respect to household total financial assets). Table 3.9 displays the average marginal effects at the extensive and intensive margins of the treatment variable, the time variable and their interaction term for liquid assets models. Table 3.10 presents the results using random effects Tobit models for illiquid financial assets, with the extensive margins and the intensive margins for the treatment variable, the time variable and their interaction term in Table 3.11.

In Table 3.8 and Table 3.10, all coefficients for the interaction term between the treatment variable and the post-treatment indicator are not significant, indicating that household post-treatment allocation on both liquid and illiquid financial assets are not significantly affected by housing demolitions in the medium term of four years. Correspondingly, in Table 3.9 and Table 3.11, the marginal effects at both the extensive and the intensive margins are not statistically significant. The results of extensive marginal effects indicate that housing demolitions, in the medium term, do not impact the probability of being uncensored in the distribution patterns of household holding shares of different financial assets. In detail, for the cash ratio and the liquid asset ratio with respect to household total financial assets, in columns (1) and (5) in Panel A of Table 3.9, the insignificance of the extensive margins indicates that housing demolitions do not impact the probability of allocating financial resources to other financial assets, with the cash ratio and the liquid asset ratio smaller than one. In columns (2) to (4) in Panel A of Table 3.9 and columns (1) to (5) in Panel A of Table 3.10, the insignificance of the coefficients of the interaction term indicates that housing demolitions do not influence the probability of holding positive financial assets apart from cash and liquid assets as well.

Table 3.8 Determinants of the composition ratios of household financial assets (liquid financial assets) (Tobit models)

Variables	(1) Cash/Financial assets	(2) Current deposits/Financial assets	(3) Time deposits/Financial assets	(4) Deposits (current and time)/Financial assets	(5) Liquid assets/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	0.002	-0.017	0.094**	0.008	0.040
	(0.022)	(0.022)	(0.046)	(0.022)	(0.040)
Time dummy (1 if 2017 and 0 otherwise)	-0.166***	0.184***	-0.251***	0.100***	-0.288***
	(0.008)	(0.008)	(0.018)	(0.008)	(0.014)
The interaction term between the treatment dummy and the time dummy	-0.006	-0.003	0.065	0.014	0.032
	(0.027)	(0.029)	(0.056)	(0.028)	(0.047)
Financial literacy (base: financial literacy scored 0)					
Financial literacy scored 1	-0.097***	0.061***	0.130***	0.088***	-0.100***
	(0.008)	(0.009)	(0.019)	(0.009)	(0.014)
Financial literacy scored 2 or 3	-0.133***	0.067***	0.233***	0.114***	-0.139***
	(0.011)	(0.011)	(0.024)	(0.011)	(0.017)
Risk attitudes (base: no risk)					
Risk attitude: low risks, low returns	-0.041***	0.028***	0.020	0.020*	-0.133***
	(0.010)	(0.011)	(0.023)	(0.011)	(0.017)
Risk attitude: average risks, average returns	-0.060***	0.058***	-0.062**	0.032***	-0.148***
	(0.010)	(0.011)	(0.024)	(0.011)	(0.017)
Risk attitude: high risks, high returns	-0.040***	0.017	-0.209***	-0.040***	-0.261***
	(0.013)	(0.014)	(0.033)	(0.014)	(0.021)
The log of household income	-0.045***	0.021***	0.113***	0.036***	-0.067***
	(0.002)	(0.002)	(0.007)	(0.002)	(0.004)
Old dependency ratio	-0.041**	-0.033*	0.250***	0.044**	0.004
	(0.017)	(0.017)	(0.038)	(0.018)	(0.031)
Young dependency ratio	0.094***	-0.037	-0.254***	-0.085***	0.099**
	(0.025)	(0.025)	(0.061)	(0.026)	(0.042)
Characteristics of household economic respondents					
Age	0.010***	-0.013***	-0.005	-0.013***	-0.007**
	(0.002)	(0.002)	(0.005)	(0.002)	(0.003)
Squared age divided by 100	-0.006***	0.009***	0.007	0.010***	0.017***
	(0.002)	(0.002)	(0.005)	(0.002)	(0.004)
Female	0.038***	-0.050***	0.018	-0.037***	0.023
	(0.008)	(0.008)	(0.019)	(0.009)	(0.014)
Attended school	-0.211***	0.153***	0.327***	0.200***	-0.267***

	(0.014)	(0.015)	(0.038)	(0.015)	(0.033)
Having a degree	-0.273***	0.120***	0.372***	0.169***	-0.469***
	(0.023)	(0.023)	(0.055)	(0.024)	(0.042)
Employment status	-0.015	0.019**	0.014	0.015	0.016
	(0.009)	(0.009)	(0.022)	(0.009)	(0.016)
Bad health dummy	0.087***	-0.056***	-0.109***	-0.073***	0.115***
	(0.009)	(0.009)	(0.020)	(0.009)	(0.015)
Hukou status	0.188***	-0.088***	-0.243***	-0.134***	0.277***
	(0.009)	(0.009)	(0.022)	(0.009)	(0.015)
Marital status	-0.052***	0.019	0.100***	0.043***	-0.047**
	(0.012)	(0.012)	(0.029)	(0.012)	(0.021)
Minority	0.043***	0.018	-0.340***	-0.038**	0.043
	(0.017)	(0.016)	(0.046)	(0.017)	(0.029)
Party membership	-0.100***	0.051***	0.099***	0.073***	-0.112***
	(0.011)	(0.011)	(0.025)	(0.011)	(0.018)
Constant	0.946***	0.119**	-2.250***	0.073	2.610***
	(0.055)	(0.056)	(0.142)	(0.057)	(0.099)
Number of observations	29,032	29,032	29,032	29,032	29,032

For the results of Tobit models, estimated coefficients are reported. *** p<0.01,** p<0.05,* p<0.1.
Standard errors in parentheses.

Table 3.9 Marginal effects of Tobit models for the liquid financial asset composition ratios

Panel A Marginal effects at extensive margins of Tobit models for the liquid financial asset composition ratios

Variables	(1) Cash/Financial assets	(2) Current deposits/Financial assets	(3) Time deposits/Financial assets	(4) Deposits (current and time)/Financial assets	(5) Liquid assets/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.001	-0.011	0.023**	0.005	-0.013
	(0.011)	(0.014)	(0.011)	(0.013)	(0.013)
Time dummy (1 if 2017 and 0 otherwise)	0.085***	0.118***	-0.062***	0.057***	0.093***
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
The interaction term between the treatment dummy and the time dummy	0.003	-0.002	0.016	0.008	-0.010
	(0.014)	(0.019)	(0.014)	(0.016)	(0.015)
Number of observations	29,032	29,032	29,032	29,032	29,032

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Panel B Marginal effects at intensive margins of Tobit models for the liquid financial asset composition ratios

Variables	(1) Cash/Financial assets	(2) Current deposits/Financial assets	(3) Time deposits/Financial assets	(4) Deposits (current and time)/Financial assets	(5) Liquid assets/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	0.001	-0.007	0.020**	0.004	0.008
	(0.012)	(0.009)	(0.010)	(0.011)	(0.008)
Time dummy (1 if 2017 and 0 otherwise)	-0.089***	0.076***	-0.053***	0.048***	-0.060***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
The interaction term between the treatment dummy and the time dummy	-0.003	-0.001	0.014	0.007	0.007
	(0.015)	(0.012)	(0.012)	(0.014)	(0.010)
Number of observations	29,032	29,032	29,032	29,032	29,032

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Table 3.10 Determinants of the composition ratios of household financial assets (illiquid financial assets) (Tobit models)

Variables	(1) Stocks/Financial assets	(2) Bonds/Financial assets	(3) Funds/Financial assets	(4) Financial management products/Financial assets	(5) Non-RMB financial assets/Financial assets	(6) Gold/Financial assets	(7) Lending/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.139**	0.055	0.004	0.055	0.000	-0.541	-0.061
	(0.060)	(0.140)	(0.058)	(0.071)	(0.003)	(0.338)	(0.062)
Time dummy (1 if 2017 and 0 otherwise)	0.012	-0.320***	-0.186***	0.479***	-0.007***	-0.543***	0.475***
	(0.020)	(0.070)	(0.024)	(0.026)	(0.001)	(0.091)	(0.019)
The interaction term between the treatment dummy and the time dummy	0.021	-0.077	-0.097	-0.051	-0.007	-0.165	0.032
	(0.070)	(0.205)	(0.079)	(0.079)	(0.005)	(0.479)	(0.070)
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.054**	0.119*	0.114***	0.050**	-0.001	0.107	0.086***
	(0.022)	(0.069)	(0.027)	(0.023)	(0.001)	(0.099)	(0.019)
Financial literacy scored 2 or 3	0.117***	0.064	0.173***	0.128***	0.000	0.135	0.084***
	(0.025)	(0.083)	(0.030)	(0.025)	(0.002)	(0.111)	(0.023)
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.162***	0.303***	0.174***	0.239***	-0.002	0.176	0.046**
	(0.028)	(0.080)	(0.032)	(0.026)	(0.002)	(0.125)	(0.023)
Risk attitude: average risks, average returns	0.244***	0.260***	0.189***	0.211***	-0.002	0.285**	0.067***
	(0.027)	(0.084)	(0.032)	(0.027)	(0.002)	(0.118)	(0.023)
Risk attitude: high risks, high returns	0.411***	0.185*	0.263***	0.248***	0.003	0.180	0.159***
	(0.030)	(0.105)	(0.037)	(0.032)	(0.002)	(0.147)	(0.028)
The log of household income	0.051***	0.165***	0.081***	0.128***	0.001*	0.133***	0.055***
	(0.007)	(0.034)	(0.010)	(0.009)	(0.000)	(0.035)	(0.005)
Old dependency ratio	0.066	0.008	0.007	0.048	-0.001	-0.094	-0.043
	(0.048)	(0.128)	(0.057)	(0.048)	(0.003)	(0.251)	(0.044)
Young dependency ratio	-0.103	-0.181	-0.140*	-0.236***	-0.007*	-0.317	0.026
	(0.069)	(0.226)	(0.083)	(0.067)	(0.004)	(0.302)	(0.054)
Characteristics of household economic respondents							
Age	0.027***	0.038**	0.019***	-0.010**	0.000	-0.072***	0.002
	(0.006)	(0.017)	(0.006)	(0.005)	(0.000)	(0.024)	(0.005)
Squared age divided by 100	-0.031***	-0.025	-0.021***	0.001	0.000	0.060**	-0.016***
	(0.006)	(0.016)	(0.007)	(0.005)	(0.000)	(0.025)	(0.005)
Female	-0.001	-0.034	0.090***	0.038*	-0.005***	0.095	-0.079***
	(0.022)	(0.067)	(0.026)	(0.021)	(0.001)	(0.101)	(0.018)

Attended school	0.641***	0.388*	0.192**	0.367***	-0.001	6.273	0.196***
	(0.181)	(0.218)	(0.091)	(0.082)	(0.002)	(274.086)	(0.040)
Having a degree	0.836***	0.484**	0.413***	0.629***	0.014***	6.674	0.182***
	(0.183)	(0.241)	(0.098)	(0.088)	(0.003)	(274.086)	(0.054)
Employment status	-0.067***	-0.105	-0.105***	-0.063**	-0.004**	0.192	0.082***
	(0.025)	(0.079)	(0.030)	(0.025)	(0.001)	(0.119)	(0.021)
Bad health dummy	-0.044*	-0.046	-0.066**	-0.063**	-0.002	-0.231**	-0.143***
	(0.024)	(0.069)	(0.027)	(0.027)	(0.001)	(0.106)	(0.021)
Hukou status	-0.617***	-0.392***	-0.516***	-0.355***	-0.006***	-0.398***	0.020
	(0.032)	(0.084)	(0.036)	(0.025)	(0.001)	(0.119)	(0.020)
Marital status	0.059*	-0.133	0.028	0.035	-0.004*	0.228	0.033
	(0.034)	(0.092)	(0.039)	(0.032)	(0.002)	(0.157)	(0.029)
Minority	-0.303***	-0.159	-0.174**	-0.113**	-0.001	-0.457	0.034
	(0.066)	(0.167)	(0.069)	(0.048)	(0.003)	(0.307)	(0.035)
Party membership	0.075***	0.159**	0.120***	0.060**	-0.006***	-0.007	0.079***
	(0.025)	(0.072)	(0.030)	(0.024)	(0.002)	(0.133)	(0.024)
Constant	-2.817***	-5.688***	-2.700***	-2.742***	-0.054***	-10.404	-1.838***
	(0.246)	(0.728)	(0.221)	(0.179)	(0.008)	(274.086)	(0.131)
Number of observations	29032	29032	29032	29032	29032	29032	29032

For the results of Tobit models, estimated coefficients are reported. *** p<0.01,** p<0.05,* p<0.1.

Standard errors in parentheses.

Table 3.11 Marginal effects of Tobit models for the illiquid financial asset composition ratios

Panel A Marginal effects at extensive margins of Tobit models for the illiquid financial asset composition ratios

Variables	(1) Stocks/Financial assets	(2) Bonds/Financial assets	(3) Funds/Financial assets	(4) Financial management products/Financial assets	(5) Non-RMB financial assets/Financial assets	(6) Gold/Financial assets	(7) Lending/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.015**	0.001	0.000	0.007	0.001	-0.004	-0.012
	(0.006)	(0.002)	(0.005)	(0.008)	(0.009)	(0.003)	(0.013)
Time dummy (1 if 2017 and 0 otherwise)	0.001	-0.005***	-0.014***	0.057***	-0.020***	-0.004***	0.096***
	(0.002)	(0.001)	(0.002)	(0.003)	(0.004)	(0.001)	(0.004)
The interaction term between the treatment dummy and the time dummy	0.002	-0.001	-0.008	-0.006	-0.018	-0.001	0.006
	(0.007)	(0.003)	(0.006)	(0.009)	(0.013)	(0.004)	(0.014)
Number of observations	29032	29032	29032	29032	29032	29032	29032

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Panel B Marginal effects at intensive margins of Tobit models for the illiquid financial asset composition ratios

Variables	(1) Stocks/Financial assets	(2) Bonds/Financial assets	(3) Funds/Financial assets	(4) Financial management products/Financial assets	(5) Non-RMB financial assets/Financial assets	(6) Gold/Financial assets	(7) Lending/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.015**	0.004	0.000	0.007	0.000	-0.042	-0.010
	(0.007)	(0.011)	(0.006)	(0.008)	(0.000)	(0.057)	(0.010)
Time dummy (1 if 2017 and 0 otherwise)	0.001	-0.025***	-0.019***	0.057***	-0.001***	-0.042	0.079***
	(0.002)	(0.006)	(0.003)	(0.003)	(0)	(0.051)	(0.003)
The interaction term between the treatment dummy and the time dummy	0.002	-0.006	-0.010	-0.006	-0.001	-0.013	0.005
	(0.008)	(0.016)	(0.008)	(0.009)	(0.001)	(0.04)	(0.012)
Number of observations	29032	29032	29032	29032	29032	29032	29032

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Additionally, the insignificant intensive marginal effects of the interaction term provide evidence that there is no causal relationship between housing demolitions and household financial asset allocation in the uncensored part, conditional on being uncensored. Specifically, looking at columns (1) and (5) in Panel B of Table 3.9, conditional on being uncensored, there is no relationship between housing demolitions and the financial allocation in cash and liquid assets. Looking at columns (3) to (4) in Panel B of Table 3.9 and columns (1) to (5) in Panel B of Table 3.11, housing demolitions do not impact household financial allocation on current deposits, time deposits, total deposits (current and time), stocks, bonds, funds, financial management products, non-RMB financial products, gold and lending, conditional on holding positive values on these financial assets.

The parallel trend assumption in the difference-in-difference method assumes that, without housing demolitions, the difference in household financial allocation between the treatment group and the control group would not change over time. Therefore, from the perspective of the parallel trend, the results of the double difference estimates indicate that the difference in financial asset allocation, measured by the share of each financial asset with respect to household total financial assets, between the treatment group and the control group does not change over time. The estimation results using random effects Tobit models based on balanced panel data show no causal relationship between housing demolitions and household allocation of financial resources.

Turning to the estimated beta coefficients for the treatment variable in Table 3.8 and Table 3.10, the reported coefficients measure the average differences of financial asset allocation ratios among different financial assets between the demolished group and the control group without the treatment. In Table 3.8, among all coefficients for the treatment variable, only the coefficient with respect to the share of time deposits in column (3) are positive and statistically significant at the 5% significance level, indicating that demolished households on average allocate more in time deposits as a part of their financial portfolios. That is, demolished households on average hold 9.4% more time deposits in their household financial portfolios compared with non-demolished households.

The marginal effect at the extensive margin of the treatment variable for the time deposit ratio is 0.023, as shown in column (3) of panel A in Table 3.9. It indicates that, compared with the households in the control group, the demolished households have a 2.3% higher probability of being uncensored. As shown in column (3) of Panel B in Table 3.9, the marginal effect at the intensive margin of the treatment variable for the time deposit model is 0.020, which indicates that, conditional on being uncensored, demolished households on average allocate 2% more financial resources on time deposits.

In Table 3.10, among all estimated marginal effects for the treatment variable, only the coefficient for the stock ratio with respect to household total financial assets is statistically significant at the 5% significance level, which is -0.139 as shown in column (1) of Table 3.10. This negative reported coefficient reveals a negative relationship between housing demolitions and the stock ratio reflecting the share of stocks households hold as one part of household financial portfolios. Specifically, demolished households on average hold 13.9% fewer stocks in their financial portfolios than non-demolished households when the stock ratio is uncensored. From the marginal effect at the extensive margin in column (1) of Panel A in Table 3.11, demolished households on average have a 1.5% lower probability of holding stocks compared with non-demolished households. According to the marginal effect at the intensive margin in column (1) of Panel A in Table 3.11, conditional on holding stocks in household financial portfolios with a stock ratio greater than zero, demolished households on average hold 1.5% fewer stocks in their financial portfolios.

In conclusion, regarding household financial allocation, based on the estimated coefficients on the interaction term between the demolition treatment variable and the post-treatment time indicator, there is no causal relationship between housing demolitions and household financial allocation. This means the difference in the asset ratios between demolished households (the treatment group) and non-demolished households (the control group) does not change over time. Besides, the estimated coefficients of the treatment variable reveal the difference between the treatment group and the control group. Empirical results provide evidence showing that there is no difference in household financial allocation in cash, current deposits, total deposits, liquid assets, bonds, funds, financial management

products, non-RMB financial products, gold and lending, between demolished households and non-demolished households. But demolished households on average have a higher probability of having time deposits and a lower probability of having stocks. Conditional on having time deposits and stocks, demolished households on average hold more time deposits and fewer stocks.

Financial literacy and risk attitudes are two important determinants included in the models. The coefficients of financial literacy variables reveal the differences in expected uncensored asset ratios between various groups with different financial literacy levels. The reference group is the households with a financial literacy score of zero. In Table 3.8, the coefficients of financial literacy variables for the cash ratios and the liquid asset ratios are significantly negative. The magnitudes of the coefficients for the financial literacy dummy representing observations with a financial literacy score of 2 or 3 are bigger than that for the financial literacy dummy representing observations with a financial literacy score of 1. Therefore, more financially literate households on average hold smaller proportions of cash and liquid assets in their financial portfolios when keeping other factors constant.

The coefficients of financial literacy variables for the three deposit models (current deposit ratios, time deposit ratios, and total deposit ratios with respect to household total financial assets) are statistically significant at the 1% significance level. These positive coefficients indicate that, compared with households with a financial literacy score of zero, households with positive financial literacy scores allocate more financial resources to the deposit assets. Combined with the magnitudes of these coefficients, it is concluded that more literate households on average invest larger percentages of household financial resources in current deposits, time deposits and total deposits. In summary, households with higher financial literacy levels will invest a lower proportion of financial assets in cash and a relatively higher proportion of financial assets in deposits as their liquid assets.

In Table 3.10, there are large disparities between financial literacy coefficients of different illiquid asset ratios with respect to household total financial assets. In columns (1), (3) and (4), all financial literacy coefficients are positive and statistically significant. Furthermore, the coefficients of financial literacy

variables representing scores 2 and 3 in these three models are larger than the coefficients of financial literacy variable for a score of 1. Therefore, more literate households on average have larger proportions of stocks, funds and financial management products in their financial assets. In column (2) of Table 3.11, for the two financial variables, only the coefficient of the financial dummy representing households with a financial literacy score of one is statistically significant at the 10% significance level, indicating that households scored one on average have a larger proportion of bonds than households scored zero, two and three.

In columns (5) and (6) of Table 3.10, the financial literacy coefficients are not significant in the models with non-RMB financial asset ratios and gold ratios as the outcome variables. The results show that financial literacy does not play a role in determining the percentages of non-RMB financial assets and gold in their household financial assets. In the last column of Table 3.10, the estimated coefficients of the low financial literacy dummy and the high financial literacy dummy are 0.086 and 0.084 respectively, which are both statistically significant at the 1% significance level. This indicates that, moving from the financial literacy group with a score of 0 to the financial literacy group with a score of 1, there is on average an increase of 8.6% in the lending ratios with respect to household financial assets. Similarly, moving from the no financial literacy group to the financial literacy group with households scored 2 or 3, there is on average an increase of 8.4% of the lending ratios. Compared with financially illiterate households, literate households on average allocate more financial resources to lending.

Turning to risk attitudes, there are three risk attitude dummies, which are used to indicate households choosing projects with low risks and low returns (the low-risk group), households choosing projects with average risks and average returns (the average risk group) and households choosing projects with high risks and high returns (the high-risk group) respectively. Table 3.8 shows the empirical results for liquid assets. The estimated results in column (5) show that households preferring higher risks on average have a lower percentage of liquid assets in their household portfolios. However, looking at the signs and magnitudes of the estimated coefficients of these three explanatory variables representing

different risk attitudes, there are no consistent patterns regarding the risk attitude coefficients in the models shown in columns (1) to (4). This is, for cash, current deposits, time deposits and total deposits, when moving from a group choosing lower risks to a group choosing higher risks, the composition ratios of them can increase, decrease and keep unchanged. The ambiguous patterns related to the composition ratios of different illiquid assets are not surprising because cash, current deposits and time deposits are safe financial assets with high liquidity, and they are substitutes in household financial portfolios.

In Table 3.10, the estimated coefficients of risk attitude variables reveal the differences in expected uncensored outcome variables regarding various illiquid asset ratios between groups with different risk attitudes. From the risk attitudes coefficients in columns (1) and (3), the results show that households on average invest a higher proportion of financial assets in stocks and funds when moving from a group choosing lower risks to a group choosing higher risks. From the coefficients of risk attitude variables in columns (2) and (7), households on average have a lower percentage of financial assets in investing bonds or lending when moving from the risky groups to the non-risk group. Looking at the risk attitude coefficients in the model of the share of financial management products, households preferring risky assets on average invest a higher proportion of financial assets than households preferring no risk. The differences range from 21.1% to 24.8% as a percentage of household total financial assets, depending on which risk attitude group they are in. In column (6), the risk attitude coefficients are not significant, indicating that risk attitudes do not impact household decisions on the financial allocation in non-RMB financial assets. In column (6), the estimated coefficients of risk attitudes indicate that households choosing average risks and average returns on average have a 28.5% higher proportion of financial assets that are invested in gold.

This chapter also examines the income effect and the life cycle effect through the inclusion of household income and the inclusion of age variables (age and age squared) reflecting the life cycle. Starting with the income effect from the coefficients of household income in the logarithmic form, only two income coefficients in the cash model and the liquid model, as shown in columns (1) and (5) of Table 3.8, are

negative, which are statistically significant at the 1% significance level. These two negative coefficients suggest a negative relationship between household income and the expected uncensored cash ratios to income and a negative relationship between household income and the liquid asset ratios with respect to household income, when keeping other factors constant. Likewise, the positive coefficients in the remaining ten models in Table 3.8 and Table 3.10 indicate a positive relationship between household income and the corresponding uncensored outcomes, including the ratios of current deposits, time deposits, total deposits, stocks, bonds, funds, financial management products, non-RMB financial assets, gold and lending with respect to household total financial assets.

As for the life cycle effect, there are five different relationships between the age of the household economic respondent and the asset-related outcomes reflecting household financial composition, including no relationship, two linear relationships (positive and negative), and two non-linear relationships (U-shaped and inversely U-shaped). First, in column (3) of Table 3.8 and column (5) of Table 3.10, the coefficients of age and age squared are not significant, implying that there is no relationship between age and the ratios of time deposits and non-RMB financial assets with respect to household total financial assets.

Second, there are two kinds of linear relationships found in the estimation results. From the Tobit estimation results, in column (2) of Table 3.10, the coefficient of the quadratic term is insignificant, but the coefficient of age is positive and significant. The empirical results suggest a positive linear relationship between age and the ratios of bonds to household income, meaning that households with older economic respondents allocate more household financial resources to bonds. In column (4) of Table 3.10, the coefficient of the quadratic term is not significant, but the age coefficient is negative, indicating a negative relationship between age and the uncensored ratios of financial management products to household total financial assets. In column (7) of Table 3.10, even if the coefficient of age squared is negative and statistically significant, the result still reflects a negative linear relationship when the age coefficient is negative and significant because age is a variable only taking positive values.

Therefore, older households tend to have a smaller lending ratio with respect to household total financial assets.

Third, the U-shaped life cycle effect and the inversely U-shaped life cycle effect are also found in the Tobit estimation results. An outcome is U-shaped over the life cycle when the quadratic term is positive while the linear term is negative, because different signs in the nonlinear models are associated with a positive turning point considering the age variable takes positive values. By contrast, an outcome is inversely U-shaped over the life cycle with a negative coefficient for the quadratic term and a positive coefficient for the linear term, related to a positive turning point. From the Tobit estimation results, there are four asset outcomes displaying a U-shaped relationship over the life cycle, including the ratios of current deposits, total deposits, liquid assets, and gold with respect to household total financial assets, as shown in columns (2), (4) and (5) of Table 3.8 and column (6) of Table 3.10. Furthermore, there are three asset outcomes proved to have an inverse U-shaped relationship, including the ratios of cash, stocks and funds to total assets, as shown in column (1) of Table 3.8 and columns (1) and (3) of Table 3.10.

3.4.3 Empirical results for household debt

The estimated beta coefficients of the random effects Tobit models regarding household debt are shown in Table 3.12. The outcome variables of household debt are the logarithm of each household debt type. Due to the log transformation, when interpreting the estimated coefficients, the percentage change is used to describe and analyse the empirical results. The reported coefficients reveal the relationship between explanatory variables and expected uncensored percentage changes of each household debt type. Table 3.13 displays the marginal effects at both the extensive and the intensive margins with respect to the treatment dummy, the time dummy and their interaction term. The average marginal effects at the extensive margins indicate the holdings of different household debt types, and the average

marginal effects at the intensive margins relate to the amounts of different debt types conditional on holdings.

From Table 3.12, it is apparent that the coefficient of the interaction term between the treatment variable and the time variable is statistically significant in the education debt model, as shown in column (3). However, the coefficients for the other three debt models are not statistically significant. The empirical results indicate that housing demolitions increase the gap in the holdings of education debt between the treatment group and the control group after the treatment, but the inter-group differences of the other three categories (housing debt, vehicle debt and credit card debt) are unchanged from the pre-treatment period to the post-treatment period. In particular, a positive relationship between household assets and total household debt is recorded in the existing literature (see, e.g. Tseng and Hsiao, 2021). This chapter adds new evidence to the existing literature that the wealth shocks stemming from housing demolitions have a positive influence on household education debt. Additionally, housing demolitions do not have a significant impact on the log level of housing debt, vehicle debt and credit card debt.

The marginal effects at both the extensive and intensive margins of the interaction term estimated for debt models are shown in Table 3.13. From columns (1), (2) and (4) of Panel A, the marginal effects at the extensive margins are not statistically significant in the models of housing debt, vehicle debt and credit card debt, indicating that the estimated effect of housing demolitions in the probability of the holdings of these three debt categories is not statistically significant. Accordingly, from the insignificant marginal effects at the intensive margins shown in columns (1), (2) and (4) of Panel B, conditional on positive holdings of these three debt categories, housing demolitions do not impact the differences of the log level of housing debt, vehicle debt and credit card debt between the treatment group and the control group after the treatment.

Table 3.12 Determinants of the logarithm of different household debt types (Tobit models)

Variables	(1) The log of housing debt	(2) The log of vehicle debt	(3) The log of education debt	(4) The log of credit card debt
Treatment dummy (1 if demolished and 0 otherwise)	-0.732	1.166	-1.324	-0.077
	(0.535)	(1.880)	(0.975)	(0.764)
Time dummy (1 if 2017 and 0 otherwise)	19.758***	11.347***	28.343***	21.320***
	(0.304)	(0.695)	(0.750)	(0.623)
The interaction term between the treatment dummy and the time dummy	1.179	-1.909	3.469*	0.981
	(1.117)	(2.300)	(2.105)	(1.875)
Financial literacy (base: financial literacy scored 0)				
Financial literacy scored 1	0.114	0.856	-0.015	1.355***
	(0.247)	(0.599)	(0.436)	(0.400)
Financial literacy scored 2 or 3	-0.229	0.804	-0.366	2.171***
	(0.321)	(0.743)	(0.600)	(0.457)
Risk attitudes (base: no risk)				
Risk attitude: low risks, low returns	0.370	0.446	0.204	1.755***
	(0.301)	(0.717)	(0.540)	(0.510)
Risk attitude: average risks, average returns	1.035***	0.708	-0.004	2.973***
	(0.287)	(0.707)	(0.523)	(0.458)
Risk attitude: high risks, high returns	0.810**	2.075**	1.593**	3.297***
	(0.362)	(0.863)	(0.622)	(0.534)
The log of household income	0.201***	0.541***	-0.330***	0.422***
	(0.053)	(0.151)	(0.080)	(0.097)
Old dependency ratio	-4.148***	-5.976***	-2.204**	-2.783**
	(0.613)	(1.559)	(1.109)	(1.224)
Young dependency ratio	3.075***	7.343***	-9.000***	-2.913***
	(0.658)	(1.604)	(1.232)	(1.108)
Characteristics of household economic respondents				
Age	0.020	-0.446***	0.657***	-0.077
	(0.061)	(0.142)	(0.120)	(0.104)
Squared age divided by 100	-0.123*	0.290*	-0.774***	-0.122
	(0.063)	(0.149)	(0.124)	(0.118)
Female	0.647***	1.169**	0.286	0.100
	(0.227)	(0.560)	(0.403)	(0.360)
Attended school	-1.146***	-0.989	1.671**	4.869***
	(0.383)	(0.987)	(0.682)	(1.789)

Having a degree	1.860***	-0.764	1.674	7.895***
	(0.590)	(1.494)	(1.304)	(1.864)
Employment status	0.739***	-0.133	0.275	0.441
	(0.268)	(0.631)	(0.473)	(0.466)
Bad health dummy	0.612***	0.659	3.160***	-0.641*
	(0.234)	(0.645)	(0.427)	(0.380)
Hukou status	-0.029	0.944	3.147***	-4.211***
	(0.254)	(0.615)	(0.486)	(0.404)
Marital status	1.029***	1.146	-0.327	0.430
	(0.364)	(0.931)	(0.626)	(0.567)
Minority	-1.069**	1.034	1.097*	-0.867
	(0.420)	(0.978)	(0.662)	(0.769)
Party membership	0.031	0.315	0.443	0.529
	(0.321)	(0.758)	(0.612)	(0.454)
Constant	-10.253***	-31.147***	-32.354***	-18.795***
	(1.593)	(3.856)	(3.160)	(3.029)
Number of observations	17,533	26,669	15,501	15,708

For the results of Tobit models, estimated coefficients are reported. *** p<0.01,** p<0.05,* p<0.1.

Standard errors in parentheses.

Table 3.13 Marginal effects of Tobit models for household debt

Panel A Marginal effects at extensive margins of Tobit models for household debt

Variables	(1) The log of housing debt	(2) The log of vehicle debt	(3) The log of education debt	(4) The log of credit card debt
Treatment dummy (1 if demolished and 0 otherwise)	-0.018	0.005	-0.011	-0.001
	(0.013)	(0.008)	(0.008)	(0.006)
Time dummy (1 if 2017 and 0 otherwise)	0.485***	0.046***	0.240***	0.169***
	(0.006)	(0.003)	(0.006)	(0.005)
The interaction term between the treatment dummy and the time dummy	0.029	-0.008	0.029*	0.008
	(0.027)	(0.009)	(0.018)	(0.015)
Number of observations	17,533	26,669	15,501	15,708

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Panel B Marginal effects at intensive margins of Tobit models for household debt

Variables	(1) The log of housing debt	(2) The log of vehicle debt	(3) The log of education debt	(4) The log of credit card debt
Treatment dummy (1 if demolished and 0 otherwise)	-0.200	0.137	-0.193	-0.010
	(0.146)	(0.221)	(0.142)	(0.097)
Time dummy (1 if 2017 and 0 otherwise)	5.392***	1.331***	4.138***	2.697***
	(0.082)	(0.079)	(0.104)	(0.077)
The interaction term between the treatment dummy and the time dummy	0.322	-0.224	0.506*	0.124
	(0.305)	(0.270)	(0.307)	(0.237)
Number of observations	17,533	26,669	15,501	15,708

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

However, from column (3) of Panel A, the marginal effect at the extensive margin of the interaction term between the treatment variable and the time variable in the education debt model is 0.029, which is statistically significant at the 10% significance level. This means that the treatment of housing demolitions is associated with a 2.9% higher probability of the indebtedness of education debt. From column (3) of Panel B, the marginal effects at the intensive margin of the interaction term in the education debt model is 0.506 at the 10% significance level, indicating that the difference between the log values of household education debt between demolished households (the treatment group) and non-demolished households (the control group) increases by 0.506 after the treatment conditional on the positive holdings of education debt.

Turning to the treatment variable, the Tobit regression coefficients of the treatment variable are not significant across all four debt models as shown in Table 3.12. The insignificant results regarding the demolition variable indicate that no difference in the uncensored latent outcomes (here, the log values of housing debt, vehicle debt, education debt and credit card debt) is found between the treatment group and the control group without housing demolitions. From the perspective of the marginal effects at both the extensive and intensive margins, as shown in Table 3.13, all estimated extensive and intensive marginal effects for the four debt models are not significant. This implies that there is no difference in the probability of non-zero holdings of each debt category, and conditional on the indebtedness of each debt category, there is no difference in the amounts of each debt category between demolished households and non-demolished households without the treatment of housing demolitions.

Additionally, this chapter explores the effects of financial literacy and risk attitudes on household holdings of housing debt, vehicle debt, education debt and credit card debt. First, looking at the coefficients of financial literacy shown in columns (1) to (3) of Table 3.12, the coefficients of both financial literacy variables are not significant in the random effects Tobit results of the three debt models (housing debt, vehicle debt and education debt). The results suggest that financial literacy does not play a role in determining household housing, vehicle and education debt. By contrast, the coefficients of the financial literacy variables are statistically significant at the 1% significance level in the credit card

debt model. Comparing the signs and magnitudes of the coefficients, we can conclude that, when moving from a group with lower financial literacy scores to a group with higher financial literacy scores, the log level of household credit card debt increases keeping other variables constant.

Second, looking at the coefficients of risk attitudes shown in Table 3.12, empirical evidence suggests different roles of risk attitudes in household different debt categories. In column (1), the coefficient of the risk attitude variable representing households preferring projects with low risks and low returns is not significant, indicating there is no difference between households preferring low risk and households preferring no risk (the reference group) in the log level of household housing debt. Contrarily, the coefficients of the risk attitude variables representing households preferring average risks and average returns and households preferring high risks and high returns are 1.035 and 0.810 respectively, which are statistically significant. The results show that, compared with households preferring risk-free projects, households preferring average or high risks on average hold more housing debt.

For the vehicle debt model and the education debt model in columns (2) and (3) of Table 3.12, the coefficients for the risk attitude dummy representing households choosing projects with low risks and low returns and the risk attitude dummy representing households choosing projects with average risks and average returns are not statistically significant, but both coefficients for the risk attitude dummy representing households preferring high risks are statistically significant and positive at the 5% significance level. According to these coefficients, empirical results show that there are no detectable significant differences among the no-risk, low-risk and average-risk groups in the expected uncensored holdings of household vehicle debt and education debt. Comparatively, the high-risk group on average hold more vehicle debt and education debt in the logarithmic form.

Turning to household income and age, the coefficients of household income and the age variables (age and age squared) suggest the income effect and the age effect in each debt model. First, looking at the coefficients of household income, all coefficients are statistically significant at the 1% significance level. In columns (1), (2) and (4) of Table 3.12, the positive coefficients of household income suggest a

positive relationship between household income and the amount of the three debt categories (housing debt, vehicle debt, and credit card debt). In contrast, in column (2) of Table 3.12, the coefficient of household income indicates a negative relationship with the amount of household education debt.

In addition, the life cycle effect on household debt reveals household debt behaviours at different stages over their life span. The age and age squared of the household economic respondent are used to reflect the life cycle in the debt models in Table 3.12. In column (1), the linear term is not significant, but the quadratic term is negative at 10% significance level, implying a negative linear relationship between age and household housing debt, considering that age is positive. In column (2), the coefficient of age is statistically significant and negative, and the coefficient of the age squared is significant and positive, indicating that vehicle debt is U-shaped over the life cycle. In column (3), the linear term is positive, but the quadratic term is negative, suggesting an inverse U-shaped relationship between age and household education debt. Finally, in column (4), both coefficients related to age and age squared are not significant, meaning that there is no relationship between age and household credit card debt.

3.4.4 Empirical results for household consumption

There are three tables displaying the estimation results of the consumption models. Table 3.14 displays the results of the generalised least square (GLS) random effects regression models for the ratios of food consumption to household income, the ratios of housing consumption to household income, the ratios of daily necessity consumption to household income, and the ratios of telecommunication consumption to household income, which are continuous dependent variables. Table 3.15 shows the Tobit coefficients estimated for the consumption models with the ratios of the remaining consumption categories with respect to household income as the dependent variable. The consumption categories include the consumption on family services, the consumption on transportation, the consumption on entertainment, the consumption on clothing, the consumption on housing maintenance, the consumption on education and the consumption on travelling. The Tobit coefficients measure the linear relationship

between independent variables and the uncensored latent consumption-to-income variables rather than the observed dependent variables.

Table 3.16 shows the marginal effects at the extensive and intensive margins of the three main variables. The consumption-to-income ratios for each consumption category measure how much households spend in each category with respect to household income. All consumption-to-income ratios using the Tobit models are censored at the value of zero, meaning that households do not spend any money in specific consumption categories. The marginal effects at the extensive margins explain the effect of explanatory variables on the probability of the consumption-to-income ratios of each consumption category being non-zero. The marginal effects at the intensive margins measure the linear effect of explanatory variables on the consumption outcomes conditional on being non-zero. That is, the intensive marginal effects evaluate the extent that the variations of the consumption-to-income ratios of each category can be explained by the variations of the explanatory variables in the models.

Starting with the analysis of the coefficients of the interaction term between the treatment variable and the time variable, this chapter sheds light on whether housing demolitions lead to the change in the differences in the outcomes between demolished households (the treatment group) and non-demolished households (the control group) over time. Looking at the four coefficients of the interaction term in columns (1) to (4) of Table 3.14, only the coefficients in the housing consumption ratios with respect to household income are statistically significant at the 5% significant level and negative being -0.022. The consumption-to-income ratio regarding housing demolitions measures the proportion of households' annual spending on bills and property management fees with respect to the total household income of each year. The negative coefficient of -0.022 indicates that the difference in the proportion of household income spent on housing consumption between demolished households and non-demolished households is narrowed by 2.2% after housing demolitions (the treatment). This implies that housing demolitions exert a negative post-treatment influence on the share of household income that households allocate to the consumption on bills and property management fees.

Table 3.14 Determinants of the household consumption ratios to household income (GLS models)

Variables	(1) Consumption on food/Income	(2) Housing consumption/Income	(3) Consumption on daily necessities/Income	(4) Consumption on telecommunication/Income
Treatment dummy (1 if demolished and 0 otherwise)	0.076*	0.013	-0.001	0.004
	(0.046)	(0.008)	(0.005)	(0.005)
Time dummy (1 if 2017 and 0 otherwise)	-0.572***	-0.075***	-0.051***	-0.047***
	(0.017)	(0.003)	(0.002)	(0.002)
The interaction term between the treatment dummy and the time dummy	-0.099	-0.022**	0.002	-0.009
	(0.061)	(0.011)	(0.007)	(0.007)
Financial literacy (base: financial literacy scored 0)				
Financial literacy scored 1	-0.095***	-0.008**	-0.004**	-0.005**
	(0.018)	(0.003)	(0.002)	(0.002)
Financial literacy scored 2 or 3	-0.108***	-0.010**	-0.008***	-0.008***
	(0.023)	(0.004)	(0.003)	(0.003)
Risk attitudes (base: no risk)				
Risk attitude: low risks, low returns	-0.029	-0.006	0.000	0.001
	(0.022)	(0.004)	(0.002)	(0.002)
Risk attitude: average risks, average returns	0.022	0.002	0.001	0.004
	(0.022)	(0.004)	(0.002)	(0.003)
Risk attitude: high risks, high returns	0.026	-0.002	0.001	0.004
	(0.028)	(0.005)	(0.003)	(0.003)
Old dependency ratio	0.257***	0.040***	0.021***	0.003
	(0.035)	(0.006)	(0.004)	(0.004)
Young dependency ratio	0.418***	0.050***	0.040***	0.023***
	(0.052)	(0.009)	(0.006)	(0.006)
Characteristics of household economic respondents				
Age	0.011***	0.002***	0.000	0.000
	(0.004)	(0.001)	(0.000)	(0.000)
Squared age divided by 100	-0.016***	-0.003***	-0.001***	-0.001***
	(0.004)	(0.001)	(0.000)	(0.000)
Female	-0.008	0.000	0.002	0.001
	(0.017)	(0.003)	(0.002)	(0.002)

Attended school	-0.116***	-0.021***	-0.010***	-0.007**
	(0.027)	(0.005)	(0.003)	(0.003)
Having a degree	-0.360***	-0.059***	-0.025***	-0.032***
	(0.046)	(0.008)	(0.005)	(0.005)
Employment status	-0.162***	-0.021***	-0.006***	-0.007***
	(0.019)	(0.003)	(0.002)	(0.002)
Bad health dummy	0.069***	0.011***	0.009***	0.005**
	(0.018)	(0.003)	(0.002)	(0.002)
Hukou status	0.187***	0.029***	0.026***	0.033***
	(0.019)	(0.003)	(0.002)	(0.002)
Marital status	-0.199***	-0.026***	-0.014***	-0.014***
	(0.024)	(0.004)	(0.003)	(0.003)
Minority	0.168***	0.008	0.025***	0.031***
	(0.032)	(0.006)	(0.004)	(0.004)
Party membership	-0.104***	-0.017***	-0.008***	-0.006**
	(0.023)	(0.004)	(0.002)	(0.003)
Constant	1.206***	0.178***	0.112***	0.138***
	(0.107)	(0.019)	(0.012)	(0.012)
Number of observations	29,366	29,357	29,367	29,357

*** p<0.01,** p<0.05,* p<0.1. Standard errors in parentheses.

Table 3.15 Determinants of the household consumption ratios to household income (Tobit models)

Variables	(1) Consumption on family services/Income	(2) Consumption on transportation/ Income	(3) Consumption on entertainment/ Income	(4) Consumption on clothing/Income	(5) Consumption on housing maintenance/ Income	(6) Consumption on education/ Income	(7) Consumption on travelling/ Income
Treatment dummy (1 if demolished and 0 otherwise)	0.001	0.008	0.002	0.002	-0.141**	-0.042*	-0.014**
	(0.003)	(0.007)	(0.002)	(0.005)	(0.056)	(0.025)	(0.007)
Time dummy (1 if 2017 and 0 otherwise)	0.025***	-0.033***	-0.001	-0.066***	0.064***	-0.081***	-0.104***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.019)	(0.009)	(0.003)
The interaction term between the treatment dummy and the time dummy	0.002	-0.001	0.000	-0.006	0.271***	0.047	0.024**
	(0.004)	(0.009)	(0.002)	(0.007)	(0.071)	(0.033)	(0.009)
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.004***	0.007**	0.006***	0.000	0.025	0.006	0.013***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.019)	(0.010)	(0.003)
Financial literacy scored 2 or 3	0.004***	0.013***	0.009***	-0.001	0.043*	0.006	0.029***
	(0.001)	(0.004)	(0.001)	(0.003)	(0.025)	(0.012)	(0.004)
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.001	0.013***	0.004***	0.007***	0.011	0.025**	0.012***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.023)	(0.012)	(0.003)
Risk attitude: average risks, average returns	0.002*	0.020***	0.006***	0.009***	0.027	0.021*	0.022***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.024)	(0.012)	(0.003)
Risk attitude: high risks, high returns	0.003*	0.023***	0.007***	0.008**	0.043	0.044***	0.033***
	(0.002)	(0.004)	(0.001)	(0.003)	(0.030)	(0.015)	(0.004)
Old dependency ratio	0.001	-0.033***	0.000	-0.030***	-0.026	-0.296***	-0.001
	(0.002)	(0.006)	(0.001)	(0.004)	(0.038)	(0.023)	(0.006)
Young dependency ratio	0.006**	0.055***	0.021***	0.076***	-0.240***	1.166***	0.009
	(0.003)	(0.008)	(0.002)	(0.006)	(0.056)	(0.027)	(0.008)
Characteristics of household economic respondents							
Age	0.000	0.002***	-0.002***	0.000	-0.011**	0.009***	-0.001**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.002)	(0.001)
Squared age divided by 100	0.000	-0.004***	0.001***	-0.002***	0.008*	-0.016***	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.002)	(0.001)
Female	0.004***	-0.018***	0.002***	-0.001	0.027	0.036***	0.010***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.018)	(0.009)	(0.003)
Attended school	0.011***	0.015***	0.015***	-0.003	0.102***	0.035**	0.034***
	(0.002)	(0.004)	(0.001)	(0.003)	(0.031)	(0.016)	(0.005)

Having a degree	0.017***	0.008	0.029***	-0.020***	0.112**	0.031	0.085***
	(0.003)	(0.007)	(0.002)	(0.005)	(0.049)	(0.025)	(0.007)
Employment status	-0.001	0.005*	-0.002**	-0.003	0.085***	0.037***	0.007**
	(0.001)	(0.003)	(0.001)	(0.002)	(0.021)	(0.010)	(0.003)
Bad health dummy	0.000	0.005	-0.005***	-0.008***	0.018	0.048***	-0.020***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.019)	(0.010)	(0.003)
Hukou status	-0.023***	0.021***	-0.022***	0.012***	0.027	-0.001	-0.052***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.020)	(0.010)	(0.003)
Marital status	-0.001	-0.004	-0.001	-0.003	0.035	0.026*	0.010***
	(0.001)	(0.004)	(0.001)	(0.003)	(0.026)	(0.014)	(0.004)
Minority	-0.005**	0.053***	-0.003*	0.018***	-0.026	-0.027	-0.011**
	(0.002)	(0.005)	(0.001)	(0.004)	(0.034)	(0.018)	(0.005)
Party membership	0.004***	0.007*	0.007***	0.000	0.056**	0.026**	0.018***
	(0.001)	(0.004)	(0.001)	(0.003)	(0.024)	(0.013)	(0.004)
Constant	-0.074***	0.033*	0.004	0.133***	-1.018***	-0.440***	-0.044***
	(0.006)	(0.017)	(0.004)	(0.012)	(0.113)	(0.060)	(0.017)
Number of observations	29,357	29,357	29,357	29,356	29,356	29,357	29,313

For the results of Tobit models, estimated coefficients are reported. *** p<0.01,** p<0.05,* p<0.1.

Standard errors in parentheses.

Table 3.16 Marginal effects of Tobit models for household consumption

Panel A Marginal effects at extensive margins of Tobit models for household consumption

Variables	(1) Consumption on family services/Income	(2) Consumption on transportation/ Income	(3) Consumption on entertainment/ Income	(4) Consumption on clothing/ Income	(5) Consumption on housing maintenance/Income	(6) Consumption on education/Income	(7) Consumption on travelling/Income
Treatment dummy (1 if demolished and 0 otherwise)	0.002	0.016	0.013	0.004	-0.028**	-0.023*	-0.026**
	(0.009)	(0.014)	(0.012)	(0.012)	(0.011)	(0.014)	(0.012)
Time dummy (1 if 2017 and 0 otherwise)	0.067***	-0.063***	-0.006	-0.154***	0.013***	-0.044***	-0.186***
	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
The interaction term between the treatment dummy and the time dummy	0.006	-0.001	-0.001	-0.014	0.054***	0.026	0.044**
	(0.010)	(0.018)	(0.015)	(0.016)	(0.014)	(0.018)	(0.017)
Number of observations	29,357	29,357	29,357	29,356	29,356	29,357	29,313

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

Panel B Marginal effects at intensive margins of Tobit models for household consumption

Variables	(1) Consumption on family services/Income	(2) Consumption on transportation/ Income	(3) Consumption on entertainment/ Income	(4) Consumption on clothing/ Income	(5) Consumption on housing maintenance/Income	(6) Consumption on education/Income	(7) Consumption on travelling/Income
Treatment dummy (1 if demolished and 0 otherwise)	0.000	0.003	0.000	0.001	-0.023**	-0.012*	-0.003**
	(0.000)	(0.003)	(0.000)	(0.002)	(0.009)	(0.007)	(0.002)
Time dummy (1 if 2017 and 0 otherwise)	0.003***	-0.013***	0.000	-0.031***	0.011***	-0.023***	-0.024***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.003)	(0.003)	(0.001)
The interaction term between the treatment dummy and the time dummy	0.000	0.000	0.000	-0.003	0.045***	0.014	0.006**
	(0.000)	(0.004)	(0.000)	(0.003)	(0.012)	(0.010)	(0.002)
Number of observations	29,357	29,357	29,357	29,356	29,356	29,357	29,313

* p<0.10 ** p<0.05 *** p<0.01. Standard errors in parentheses.

In columns (5) and (7) of Table 3.15, the coefficients of the interaction term between the treatment variable and the time variable are statistically significant and positive, indicating that the difference between the two ratios of the consumption on housing maintenance and the consumption on travelling with respect to household income is widened after the treatment of housing demolitions. The effects of housing demolitions on these two ratios can be explored in more detail from the marginal effect at both the extensive and the intensive margins. In Panel A of Table 3.16, the marginal effects at the extensive margins for the models for the consumption-to-income ratios of the consumption on housing maintenance and the consumption on travelling are 0.054 and 0.044 respectively. These two coefficients indicate that, with the treatment of housing demolitions, demolished households have a higher probability of 5.4% in having positive consumption on housing maintenance and a higher probability of 4.4% in having positive consumption on travelling.

Regarding the marginal effects at the intensive margins, as shown in Panel B of Table 3.16, the intensive marginal effects of the interaction term for the consumption-to-income ratios of the consumption on housing maintenance and the travelling consumption are 0.045 and 0.006. These two coefficients provide empirical evidence suggesting that, conditional on having positive consumption on housing maintenance and travelling with corresponding consumption-to-income ratios being non-zero, the difference of the two consumption ratios between demolished households and non-demolished households is increased by 4.5% and 0.6% after the treatment of housing demolitions, keeping other factors constant. This means, condition on being non-zero, demolished households allocate 5.4% more of household total income in the consumption of housing maintenance and 0.6% more of household total income in the travelling consumption.

The treatment variable is another variable related to housing demolitions in the models. The coefficients of the treatment variable reflect the average difference in outcomes between demolished households and non-demolished households without treatment. In Table 3.14, the coefficient of the treatment variable in the food consumption model is 0.076, which is statistically significant at the 10% significance level, as shown in column (1). This indicates that without the treatment of housing

demolitions demolished households on average spend 7.6% more of total household income on food consumption compared with non-demolished households in the control group. In contrast, from the treatment coefficients in columns (2) to (4) of Table 3.14, the significant estimates suggest that there is no difference in the ratio outcomes with respect to the consumption on housing (i.e., bills and property management fees), the consumption on daily necessities, and the consumption on telecommunication in the pre-treatment period.

Similarly, from columns (1) to (4) of Table 3.15, the four coefficients of the treatment variable are not statistically significant, indicating that there is no difference between demolished households and non-demolished households in the allocation of household income in the consumption on family services, transportation, entertainment and clothing in the pre-treatment periods. As shown in columns (5) to (7), the coefficients of the treatment variable are negative and statistically significant at the 5% or 10% significance level. The negative coefficients imply that without the treatment of housing demolitions demolished households have a relatively lower consumption ratio regarding the consumption on housing maintenance, education and travelling. In detail, demolished households on average spend a 14.1% lower proportion of household income on housing maintenance consumption, a 4.2% lower percentage of household income on education consumption, and a 1.4% lower on travelling consumption compared with non-demolished households.

Combining the results of the treatment coefficients with the analysis of the coefficients of the interaction term discussed above, housing demolitions do not have any impacts on household consumption on daily necessities, telecommunication, family services, transportation, entertainment, and clothing measured as ratios with respect to household income in both the pre-treatment period and the post-treatment period. By contrast, regarding the model of the ratios of food consumption to income, the pre-treatment difference between demolished households and non-demolished households is positive, and the gap is unchanged after the treatment. For household housing consumption on bills and property management fees, there is no difference between demolished households and non-demolished households in the pre-

treatment period, but demolished households allocate a lower fraction of household income in housing consumption after housing demolitions compared with non-demolished households.

As for the consumption on housing maintenance and the consumption on travelling, the treatment coefficients are significantly negative, and the interaction coefficients are positive in both models. The negative treatment coefficients indicate that, without the treatment of housing demolitions, demolished households on average allocate a lower fraction of household income to the consumption on housing maintenance and travelling, keeping other factors constant. However, the gap between the treatment group and the comparison group goes from negative to positive, because in both models the interaction coefficients are positive and the magnitude of the interaction coefficients is greater than that of the treatment coefficients. Therefore, after the treatment of housing demolitions, demolished households allocate a higher proportion of household income to the consumption on housing maintenance and travelling.

The remaining is two key variables – financial literacy and risk attitudes. The reference group for financial literacy contains households whose financial literacy scores are zero. There are two financial literacy indicators with one financial literacy variable representing households whose financial literacy scores are one and the other representing households whose financial literacy scores are two or three. As shown in the last column of Panel D in Table 3.3, the dependent variables in the four consumption models in Table 3.14 are continuous, implying that the majority of households have positive consumption on these four categories, including food, housing (bills and property management fees), daily necessities, and telecommunication. In Table 3.14, all financial literacy coefficients are negative and statistically significant at the 1% or 5% significance level, indicating that financially literate households spend a lower percentage of their household income on the consumption on food, housing, daily necessities, and telecommunication. Considering the magnitude of the financial literacy coefficients, financial literacy has a negative impact on the ratios of household consumption on food, housing, daily necessities, and telecommunication with respect to household income.

Different from the consumption variables in Table 3.14, the dependent variables of the consumption ratios with respect to household income in Table 3.15 are censored at the value of zero. In columns (1), (2), (3) and (7) of Table 3.15, the financial literacy coefficients are positive and statistically significant at the 1% or 5% significance level. This indicates that financially literate households on average allocate a higher proportion of their household income in these consumption categories including family services, transportation, entertainment, and travelling. In columns (4) and (6), the coefficients for the two financial literacy variables are not statistically significant, implying that there is no difference between households with different financial literacy scores in the consumption ratios of clothing and education to household income. In column (5), regarding the consumption on housing maintenance, only the coefficient of the financial literacy variable indicating households with a higher financial literacy score of two or three is statistically significant at the 10% significance level, suggesting that households in the financial literacy group with households scored two or three have a higher consumption-to-income ratio with respect to housing maintenance compared with financially illiterate households and households with a lower financial literacy level.

For risk attitudes, the reference group includes households who choose projects with no risks. There are three different relevant variables indicating different groups with different risk attitudes. In Table 3.14, all coefficients related to risk attitudes are not statistically significant, implying that risk attitudes do not determine household decisions on the allocation of household income in these consumption categories including food, housing (bills and property management fees), daily necessities, and telecommunication after controlling other determinants. In addition, as shown in column (5) of Table 3.15, the statistically insignificant coefficients for the three variables related to risk attitudes also suggest that there is no difference between various groups with different risk attitudes in the ratios of the consumption on housing maintenance to household income.

As for the risk attitude coefficients in other models contained in Table 3.15, different patterns of inter-group differences are found by comparing the magnitude of each coefficient related to risk attitudes involved in each model, even if all coefficients related to risk attitudes are positive. In the first column

of Table 3.15, the insignificant coefficient of the low-risk variable suggests that there is no difference between the low-risk households and the reference group preferring no risk in the consumption-to-income ratios regarding family services. On the contrary, households preferring projects with average and high risks on average spend more income on the consumption on family services. In columns (2) and (3), the corresponding coefficients of risk attitude variables indicate that households preferring projects with a higher risk level on average have higher consumption-to-income ratios regarding transportation and entertainment.

In column (4) of Table 3.15, the risk attitude coefficients in the clothing consumption model are 0.007, 0.009 and 0.008 for different groups representing households preferring low risks, average risks, and high risks respectively. The results indicate the positive gap of the consumption-to-income ratios of clothing between households preferring risks and households preferring no risk is 0.7% for the low-risk group, 0.9% for the average-risk group being peak, and 8% for the high-risk group. In column (6) of Table 3.15, the coefficients of the risk attitude variables are 0.025, 0.021 and 0.044 respectively, indicating that the difference between households preferring risks and households preferring no risk in the ratios of education consumption to household income is 2.5% for the low-risk group, 2.1% for the average-risk group being a trough, and 4.4% for the high-risk group. At last, as shown in the last column of Table 3.15, when moving from a group preferring lower risks to a group preferring higher risks, households on average spent a higher proportion of household income on travelling.

This chapter also sheds light on the life cycle effect. All consumption models contain the age variable and the age squared divided by 100, reflecting the life cycle. From the coefficients shown in Table 3.14 and Table 3.15, there are four different relationships between age and consumption ratios, including no effect, the U-shaped relationship, the inversely U-shaped relationship, and the linear relationship. For the consumption ratios of food in column (1) of Table 3.14, housing (bills and property management fees) in column (2) of Table 3.14, transportation in column (2) of Table 3.15, and education in column (5) of Table 3.15, there is an inversely U-shaped relationship between age and the consumption ratios

because both coefficients of age are statistically significant and the coefficient of the quadratic term of age is negative.

Likewise, in columns (3) and (5) of Table 3.15, the coefficients of both age variables (age and age squared) are significant, indicating a nonlinear relationship between age and the outcomes. Specifically, the consumption on entertainment and the consumption on housing maintenance are U-shaped over the life cycle, after controlling other determinants. Furthermore, from the results, a linear relationship is also found between age and some consumption ratios. Considering that age is a variable greater than zero, there is a linear relationship between age and outcomes under two scenarios in the estimation results. The first is when the coefficient of the quadratic term is negative and the coefficient of age is insignificant. The second is when the estimated coefficient of the quadratic term is not significant but the coefficient of age is significant. Therefore, as shown in columns (3) and (4) of Table 3.14 and columns (4) and (7), there is a negative linear relationship between age and these four consumption ratios of daily necessities, telecommunication, clothing, and travelling over the life cycle. Besides, there is no age effect found in the model of the ratios of the consumption on family services to income.

3.5 Conclusion and Discussion

Housing demolitions indeed change the economic endowments of demolished households to some extent. Considering the exogenous feature of housing demolitions, it provides a good opportunity to examine the role of housing demolitions in determining household financial and consumption behaviours using balanced panel data constructed from the CHFS. Applying a difference-in-difference estimation strategy, the results indicate that housing demolitions (the treatment) significantly increase the likelihood of positive holdings and amounts of education debt (in the logarithmic form), housing consumption (e.g., bills and property management fees) as ratios to income, consumption on housing maintenance as ratios to income, and travelling consumption as ratios to income. However, interestingly

the causal effects of housing demolitions are not significant for all financial assets, other debt categories and other consumption categories.

The empirical results of the asset equations suggest that no causal relationship is founded between housing demolition and households' allocation of financial resources in different assets. This finding is not in line with the conclusion of Shi and He (2022) that there is a positive causal relationship between housing demolitions and risky asset participation, measured as the likelihood of owing at least one risky asset. The methods of obtaining the treatment variables and the data used for estimation are not identical because Shi and He identify the demolished households only relying on the question asking the respondents whether they experienced housing demolitions in the past two years. Therefore, the results are not comparable. However, the finding shows that household asset allocation is unaffected by scale toward the wealth shock, which is consistent with the assumption of constant relative risk aversion. For household debt, the causal relationship is only found between housing demolitions and education debt. Under the assumption of a parallel trend, the difference between demolished and non-demolished households is widened after housing demolitions. One plausible explanation is that, after housing demolition, households face heavier burdens on education.

Next, the analysis of consumption indicates that the causal effect of housing demolitions is found in the consumption on housing (e.g., bills and property management fees), housing maintenance, and travelling. This indicates that housing consumption, housing maintenance consumption, and travelling consumption are sensitive and responsive to housing demolitions. This is not inconsistent with the recent findings of Fan and Yang (2022) that housing demolitions negatively impact household consumption. As mentioned earlier, considering that variables and models are different, the results are not comparable.[30] All empirical results of this chapter provide totally new evidence of the impacts of housing demolition in the field of household finance.

[30] As introduced and discussed in the data section, this chapter insists that the construction of the treatment variable only relying on the question asking respondents whether they ever experienced housing demolitions in the past two years is not appropriate.

The deficiencies of data used in this chapter lead to some limitations of this chapter. First, the selected time interval is four years. That is, this chapter explores the medium-term impacts of housing demolitions on household financial and consumption decisions over an interval of four years. The passive choice of four years comes from the limitations of the CHFS data. When more suitable data are available, it is meaningful to explore the impacts of housing demolitions in the short-term, medium-term and long-term respectively. Second, as in Li (2021), this chapter assumes that financial literacy is unchanged over time. It is expected that the relaxation of the constant financial literacy assumption potentially leads to more reliable results.

Inspired by the literature review and the findings of this chapter, when policymakers in China make relevant laws and regulations, the market value of demolished houses should not be the exclusive dimension. The regulations and decrees have been developed and improved in the past thirty years, but the focus of the prevailing regulations is still the monetary value of demolished properties, ignoring the dual attributes of housing properties, household assets and consumption goods. From the empirical results, housing demolitions lead to heavier burdens in education debt and higher consumption as ratios to household income in housing-related activities (e.g., bills, property management fees, and maintenance fees) and travelling. Combined with the results of no impacts on household financial assets, empirical evidence shows the attribute of housing properties as consumption goods cannot be ignored. Housing demolitions create a burden for affected households, as evidenced by increased debt and higher spending in certain consumption categories. In essence, in the housing demolition decisions, authorities are in an absolutely dominant position, compared with demolished households. With a balance of social equity and justice, policymakers should ensure that the affected households will not be worse off after housing demolitions.

3.6 Appendices

Appendix 3.1 Survey Questions in relation to risk attitudes and financial literacy

Wave 2013	Risk attitudes	*What is your choice among combinations of risk and return?* 1. *High risk, high return* 2. *Slightly above-average risk, slightly above-average return* 3. *Average risk, average return* 4. *Slightly below-average risk, slightly below-average return* 5. *Unwilling to take any risk*
	Financial literacy	*[Interest rates] Given a 4% interest rate, how much would you have after 5 years if you have 100 RMB at first?* 1. *Under 120* 2. *Exactly 120* 3. *Over 120* 4. *Cannot figure out* *[Inflation rates] With an interest rate of 5% and an inflation rate of 3%, after saving money in the bank for 1 year, can you buy more or less than last year?* 1. *More than last year* 2. *The same as last year* 3. *Less than last year* *[Risk diversification] Do you think stocks have greater risks than equity funds?* 1. *Yes* 2. *No* 3. *Never heard of stock* 4. *Never heard of equity fund* 5. *Never heard of neither*
Wave 2015	Risk attitudes	*Which of the choices below do you want to invest most if you have adequate money?*

		1. *Projects with high risks and high returns* 2. *Projects with slightly high risks and slightly high returns* 3. *Projects with average risks and average returns* 4. *Projects with low risks and low returns* 5. *Unwilling to take any risk* 6. *No idea*
	Financial literacy	*[Interest rates] Given a 4% interest rate, how much would you have in total after 1 year if you have 100 yuan deposited?* 1. *Under 104* 2. *104* 3. *Over 104* 4. *Cannot figure out* *[Inflation rates] With an interest rate of 5% and an inflation rate of 3%, the stuff you buy with the money you have saved in the bank for 1 year is* 1. *More than last year* 2. *The same as last year* 3. *Less than last year* 4. *Cannot figure out* *[Risk diversification] Which one do you think is riskier, stocks or funds?* 1. *Stocks* 2. *Funds* 3. *Haven't heard about stocks* 4. *Haven't heard about funds* 5. *Neither of them have been heard about*

Note: the description of survey questions is directly taken from the English version of questionnaires that can be downloaded from the official website (https://chfs.swufe.edu.cn/). Approved access is required. In the table above, some typos and mistakes in the official questionnaires are corrected (e.g., 'staff' changed to 'stuff', 'riskier' to 'risker' and so on).

Appendix 3.2 Marginal effects at extensive margins of Tobit models for the liquid financial asset composition ratios

Variables	(1) Cash/Financial assets	(2) Current deposits/Financial assets	(3) Time deposits/Financial assets	(4) Deposits (current and time)/Financial assets	(5) Liquid assets/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.001	-0.011	0.023**	0.005	-0.013
Time dummy (1 if 2017 and otherwise)	0.085***	0.118***	-0.062***	0.057***	0.093***
The interaction term between the treatment dummy and the time dummy	0.003	-0.002	0.016	0.008	-0.010
Financial literacy (base: financial literacy scored 0)					
Financial literacy scored 1	0.049***	0.039***	0.032***	0.050***	0.032***
Financial literacy scored 2 or 3	0.068***	0.043***	0.057***	0.065***	0.045***
Risk attitudes (base: no risk)					
Risk attitude: low risks, low returns	0.021***	0.018***	0.005	0.011*	0.043***
Risk attitude: average risks, average returns	0.031***	0.037***	-0.015**	0.018***	0.048***
Risk attitude: high risks, high returns	0.020***	0.011	-0.051***	-0.023***	0.084***
The log of household income	0.023***	0.014***	0.028***	0.020***	0.021***
Old dependency ratio	0.021**	-0.021*	0.062***	0.025**	-0.001
Young dependency ratio	-0.048***	-0.023	-0.063***	-0.048***	-0.032**
Characteristics of household economic respondents					
Age	-0.005***	-0.008***	-0.001	-0.007***	0.002**
Squared age divided by 100	0.003***	0.006***	0.002	0.006***	-0.005***
Female	-0.019***	-0.032***	0.005	-0.021***	-0.007
Attended school	0.108***	0.098***	0.081***	0.114***	0.086***
Having a degree	0.140***	0.076***	0.092***	0.096***	0.151***
Employment status	0.008	0.012**	0.003	0.009	-0.005
Bad health dummy	-0.045***	-0.036***	-0.027***	-0.041***	-0.037***
Hukou status	-0.096***	-0.056***	-0.060***	-0.076***	-0.089***
Marital status	0.026***	0.012	0.025***	0.025***	0.015**
Minority	-0.022***	0.012	-0.084***	-0.021**	-0.014
Party membership	0.051***	0.033***	0.024***	0.041***	0.036***
Number of observations	29032	29032	29032	29032	29032

Appendix 3.3 Marginal effects at intensive margins of Tobit models for the liquid financial asset composition ratios

Variables	(1) Cash/Financial assets	(2) Current deposits/Financial assets	(3) Time deposits/Financial assets	(4) Deposits (current and time)/Financial assets	(5) Liquid assets/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	0.001	-0.007	0.020**	0.004	0.008
Time dummy (1 if 2017 and otherwise)	-0.089***	0.076***	-0.053***	0.048***	-0.060***
The interaction term between the treatment dummy and the time dummy	-0.003	-0.001	0.014	0.007	0.007
Financial literacy (base: financial literacy scored 0)					
Financial literacy scored 1	-0.052***	0.025***	0.027***	0.042***	-0.021***
Financial literacy scored 2 or 3	-0.071***	0.028***	0.049***	0.055***	-0.029***
Risk attitudes (base: no risk)					
Risk attitude: low risks, low returns	-0.022***	0.012***	0.004	0.009*	-0.028***
Risk attitude: average risks, average returns	-0.032***	0.024***	-0.013**	0.015***	-0.031***
Risk attitude: high risks, high returns	-0.021***	0.007	-0.044***	-0.019***	-0.055***
The log of household income	-0.024***	0.009***	0.024***	0.017***	-0.014***
Old dependency ratio	-0.022**	-0.014*	0.052***	0.021**	0.001
Young dependency ratio	0.050***	-0.015	-0.053***	-0.041***	0.021**
Characteristics of household economic respondents					
Age	0.006***	-0.005***	-0.001	-0.006***	-0.001**
Squared age divided by 100	-0.003***	0.004***	0.001	0.005***	0.004***
Female	0.020***	-0.021***	0.004	-0.018***	0.005
Attended school	-0.113***	0.064***	0.069***	0.096***	-0.056***
Having a degree	-0.146***	0.050***	0.078***	0.081***	-0.098***
Employment status	-0.008	0.008**	0.003	0.007	0.003
Bad health dummy	0.047***	-0.023***	-0.023***	-0.035***	0.024***
Hukou status	0.101***	-0.037***	-0.051***	-0.064***	0.058***
Marital status	-0.028***	0.008	0.021***	0.021***	-0.010**
Minority	0.023***	0.008	-0.071***	-0.018**	0.009
Party membership	-0.054***	0.021***	0.021***	0.035***	-0.023***
Number of observations	29032	29032	29032	29032	29032

Appendix 3.4 Marginal effects at extensive margins of Tobit models for the illiquid financial asset composition ratios

Variables	(1) Stocks/Financial assets	(2) Bonds/Financial assets	(3) Funds/Financial assets	(4) Financial management products/Financial assets	(5) Non-RMB financial assets/Financial assets	(6) Gold/Financial assets	(7) Lending/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.015**	0.001	0.000	0.007	0.001	-0.004	-0.012
Time dummy (1 if 2017 and otherwise)	0.001	-0.005***	-0.014***	0.057***	-0.020***	-0.004***	0.096***
The interaction term between the treatment dummy and the time dummy	0.002	-0.001	-0.008	-0.006	-0.018	-0.001	0.006
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.006**	0.002*	0.009***	0.006**	-0.004	0.001	0.017***
Financial literacy scored 2 or 3	0.012***	0.001	0.013***	0.015***	-0.001	0.001	0.017***
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.017***	0.004***	0.013***	0.028***	-0.007	0.001	0.009**
Risk attitude: average risks, average returns	0.026***	0.004***	0.015***	0.025***	-0.005	0.002**	0.014***
Risk attitude: high risks, high returns	0.044***	0.003*	0.020***	0.029***	0.008	0.001	0.032***
The log of household income	0.005***	0.002***	0.006***	0.015***	0.001*	0.001***	0.011***
Old dependency ratio	0.007	0.000	0.001	0.006	-0.004	-0.001	-0.009
Young dependency ratio	-0.011	-0.003	-0.011*	-0.028***	-0.020*	-0.002	0.005
Characteristics of household economic respondents							
Age	0.003***	0.001**	0.001***	-0.001**	0.000	-0.001***	0.000
Squared age divided by 100	-0.003***	0.000	-0.002***	0.000	0.000	0.000**	-0.003***
Female	0.000	0.000	0.007***	0.005*	-0.013***	0.001	-0.016***
Attended school	0.068***	0.006*	0.015**	0.043***	-0.003	0.049	0.040***
Having a degree	0.089***	0.007**	0.032***	0.074***	0.039***	0.052	0.037***
Employment status	-0.007***	-0.002	-0.008***	-0.007**	-0.010**	0.001	0.016***
Bad health dummy	-0.005*	-0.001	-0.005**	-0.007**	-0.005	-0.002**	-0.029***
Hukou status	-0.066***	-0.006***	-0.040***	-0.042***	-0.017***	-0.003***	0.004
Marital status	0.006*	-0.002	0.002	0.004	-0.010*	0.002	0.007
Minority	-0.032***	-0.002	-0.013**	-0.013**	-0.003	-0.004	0.007
Party membership	0.008***	0.002**	0.009***	0.007**	-0.017***	0.000	0.016***
Number of observations	29032	29032	29032	29032	29032	29032	29032

Appendix 3.5 Marginal effects at intensive margins of Tobit models for the illiquid financial asset composition ratios

Variables	(1) Stocks/Financial assets	(2) Bonds/Financial assets	(3) Funds/Financial assets	(4) Financial management products/Financial assets	(5) Non-RMB financial assets/Financial assets	(6) Gold/Financial assets	(7) Lending/Financial assets
Treatment dummy (1 if demolished and 0 otherwise)	-0.015**	0.004	0.000	0.007	0.000	-0.042	-0.010
Time dummy (1 if 2017 and otherwise)	0.001	-0.025***	-0.019***	0.057***	-0.001***	-0.042	0.079***
The interaction term between the treatment dummy and the time dummy	0.002	-0.006	-0.010	-0.006	-0.001	-0.013	0.005
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.006**	0.009*	0.012***	0.006**	0.000	0.008	0.014***
Financial literacy scored 2 or 3	0.013***	0.005	0.018***	0.015***	0.000	0.011	0.014***
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.018***	0.024***	0.018***	0.029***	0.000	0.014	0.008**
Risk attitude: average risks, average returns	0.027***	0.021***	0.020***	0.025***	0.000	0.022	0.011***
Risk attitude: high risks, high returns	0.046***	0.015*	0.027***	0.030***	0.000	0.014	0.026***
The log of household income	0.006***	0.013***	0.008***	0.015***	0.000*	0.010	0.009***
Old dependency ratio	0.007	0.001	0.001	0.006	0.000	-0.007	-0.007
Young dependency ratio	-0.011	-0.014	-0.015*	-0.028***	-0.001*	-0.025	0.004
Characteristics of household economic respondents							
Age	0.003***	0.003**	0.002***	-0.001**	0.000	-0.006	0.000
Squared age divided by 100	-0.003***	-0.002	-0.002***	0.000	0.000	0.005	-0.003***
Female	0.000	-0.003	0.009***	0.005*	-0.001***	0.007	-0.013***
Attended school	0.071***	0.031*	0.020**	0.044***	0.000	0.489	0.033***
Having a degree	0.093***	0.038**	0.043***	0.075***	0.002***	0.520	0.030***
Employment status	-0.007***	-0.008	-0.011***	-0.008**	-0.001**	0.015	0.014***
Bad health dummy	-0.005*	-0.004	-0.007**	-0.008**	0.000	-0.018	-0.024***
Hukou status	-0.069***	-0.031***	-0.054***	-0.042***	-0.001***	-0.031	0.003
Marital status	0.007*	-0.011	0.003	0.004	-0.001*	0.018	0.006
Minority	-0.034***	-0.013	-0.018**	-0.014**	0.000	-0.036	0.006
Party membership	0.008***	0.013**	0.013***	0.007**	-0.001***	-0.001	0.013***
Number of observations	29032	29032	29032	29032	29032	29032	29032

Appendix 3.6 Marginal effects at extensive margins of Tobit models for household debt

Variables	(1) The log of housing debt	(2) The log of vehicle debt	(3) The log of education debt	(4) The log of credit card debt
Treatment dummy (1 if demolished and 0 otherwise)	-0.018	0.005	-0.011	-0.001
Time dummy (1 if 2017 and otherwise)	0.485***	0.046***	0.240***	0.169***
The interaction term between the treatment dummy and the time dummy	0.029	-0.008	0.029*	0.008
Financial literacy (base: financial literacy scored 0)				
Financial literacy scored 1	0.003	0.003	0.000	0.011***
Financial literacy scored 2 or 3	-0.006	0.003	-0.003	0.017***
Risk attitudes (base: no risk)				
Risk attitude: low risks, low returns	0.009	0.002	0.002	0.014***
Risk attitude: average risks, average returns	0.025***	0.003	0.000	0.024***
Risk attitude: high risks, high returns	0.020**	0.008**	0.013**	0.026***
The log of household income	0.005***	0.002***	-0.003***	0.003***
Old dependency ratio	-0.102***	-0.024***	-0.019**	-0.022**
Young dependency ratio	0.076***	0.030***	-0.076***	-0.023***
Characteristics of household economic respondents				
Age	0.000	-0.002***	0.006***	-0.001
Squared age divided by 100	-0.003*	0.001*	-0.007***	-0.001
Female	0.016***	0.005**	0.002	0.001
Attended school	-0.028***	-0.004	0.014**	0.039***
Having a degree	0.046***	-0.003	0.014	0.063***
Employment status	0.018***	-0.001	0.002	0.003
Bad health dummy	0.015***	0.003	0.027***	-0.005*
Hukou status	-0.001	0.004	0.027***	-0.033***
Marital status	0.025***	0.005	-0.003	0.003
Minority	-0.026**	0.004	0.009*	-0.007
Party membership	0.001	0.001	0.004	0.004
Number of observations	17533	26669	15501	15708

Appendix 3.7 Marginal effects at intensive margins of Tobit models for household debt

Variables	(1) The log of housing debt	(2) The log of vehicle debt	(3) The log of education debt	(4) The log of credit card debt
Treatment dummy (1 if demolished and 0 otherwise)	-0.200	0.137	-0.193	-0.010
Time dummy (1 if 2017 and otherwise)	5.392***	1.331***	4.138***	2.697***
The interaction term between the treatment dummy and the time dummy	0.322	-0.224	0.506*	0.124
Financial literacy (base: financial literacy scored 0)				
Financial literacy scored 1	0.031	0.100	-0.002	0.171***
Financial literacy scored 2 or 3	-0.062	0.094	-0.053	0.275***
Risk attitudes (base: no risk)				
Risk attitude: low risks, low returns	0.101	0.052	0.030	0.222***
Risk attitude: average risks, average returns	0.282***	0.083	-0.001	0.376***
Risk attitude: high risks, high returns	0.221**	0.243**	0.233**	0.417***
The log of household income	0.055***	0.063***	-0.048***	0.053***
Old dependency ratio	-1.132***	-0.701***	-0.322**	-0.352**
Young dependency ratio	0.839***	0.861***	-1.314***	-0.369***
Characteristics of household economic respondents				
Age	0.005	-0.052***	0.096***	-0.010
Squared age divided by 100	-0.034*	0.034*	-0.113***	-0.015
Female	0.177***	0.137**	0.042	0.013
Attended school	-0.313***	-0.116	0.244**	0.616***
Having a degree	0.508***	-0.090	0.244	0.999***
Employment status	0.202***	-0.016	0.040	0.056
Bad health dummy	0.167***	0.077	0.461***	-0.081*
Hukou status	-0.008	0.111	0.459***	-0.533***
Marital status	0.281***	0.134	-0.048	0.054
Minority	-0.292**	0.121	0.160*	-0.110
Party membership	0.009	0.037	0.065	0.067
Number of observations	17533	26669	15501	15708

Appendix 3.8 Marginal effects at extensive margins of Tobit models for household consumption

Variables	(1) Consumption on family services/Income	(2) Consumption on transportation/ Income	(3) Consumption on entertainment/ Income	(4) Consumption on clothing/Income	(5) Consumption on housing maintenance/ Income	(6) Consumption on education/ Income	(7) Consumption on travelling/ Income
Treatment dummy (1 if demolished and 0 otherwise)	0.002	0.016	0.013	0.004	-0.028**	-0.023*	-0.026**
Time dummy (1 if 2017 and otherwise)	0.067***	-0.063***	-0.006	-0.154***	0.013***	-0.044***	-0.186***
The interaction term between the treatment dummy and the time dummy	0.006	-0.001	-0.001	-0.014	0.054***	0.026	0.044**
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.009***	0.014**	0.044***	-0.001	0.005	0.003	0.023***
Financial literacy scored 2 or 3	0.010***	0.026***	0.060***	-0.001	0.008*	0.003	0.051***
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.003	0.024***	0.026***	0.018***	0.002	0.013**	0.022***
Risk attitude: average risks, average returns	0.005*	0.038***	0.043***	0.022***	0.005	0.012*	0.040***
Risk attitude: high risks, high returns	0.008*	0.044***	0.050***	0.019**	0.008	0.024***	0.059***
Old dependency ratio	0.003	-0.064***	-0.003	-0.070***	-0.005	-0.161***	-0.002
Young dependency ratio	0.016**	0.106***	0.142***	0.179***	-0.048***	0.634***	0.015
Characteristics of household economic respondents							
Age	0.000	0.004***	-0.010***	0.001	-0.002**	0.005***	-0.002**
Squared age divided by 100	0.001	-0.008***	0.008***	-0.004***	0.002*	-0.009***	0.001
Female	0.010***	-0.034***	0.014***	-0.003	0.006	0.020***	0.017***
Attended school	0.029***	0.029***	0.102***	-0.007	0.021***	0.019**	0.060***
Having a degree	0.044***	0.016	0.195***	-0.048***	0.022**	0.017	0.153***
Employment status	-0.002	0.010*	-0.013**	-0.006	0.017***	0.020***	0.012**
Bad health dummy	0.000	0.009	-0.033***	-0.018***	0.004	0.026***	-0.035***
Hukou status	-0.062***	0.039***	-0.147***	0.028***	0.005	-0.001	-0.093***
Marital status	-0.003	-0.007	-0.004	-0.008	0.007	0.014*	0.018***
Minority	-0.012**	0.102***	-0.018*	0.041***	-0.005	-0.015	-0.020**
Party membership	0.010***	0.013*	0.048***	0.000	0.011**	0.014**	0.033***
Number of observations	29357	29357	29357	29356	29356	29357	29313

Appendix 3.9 Marginal effects at intensive margins of Tobit models for household consumption

Variables	(1) Consumption on family services/Income	(2) Consumption on transportation /Income	(3) Consumption on entertainment /Income	(4) Consumption on clothing /Income	(5) Consumption on housing maintenance /Income	(6) Consumption on education /Income	(7) Consumption on travelling /Income
Treatment dummy (1 if demolished and 0 otherwise)	0.000	0.003	0.000	0.001	-0.023**	-0.012*	-0.003**
Time dummy (1 if 2017 and otherwise)	0.003***	-0.013***	0.000	-0.031***	0.011***	-0.023***	-0.024***
The interaction term between the treatment dummy and the time dummy	0.000	0.000	0.000	-0.003	0.045***	0.014	0.006**
Financial literacy (base: financial literacy scored 0)							
Financial literacy scored 1	0.000***	0.003**	0.001***	0.000	0.004	0.002	0.003***
Financial literacy scored 2 or 3	0.000***	0.005***	0.002***	0.000	0.007*	0.002	0.007***
Risk attitudes (base: no risk)							
Risk attitude: low risks, low returns	0.000	0.005***	0.001***	0.004***	0.002	0.007**	0.003***
Risk attitude: average risks, average returns	0.000*	0.008***	0.001***	0.004***	0.004	0.006*	0.005***
Risk attitude: high risks, high returns	0.000*	0.009***	0.002***	0.004**	0.007	0.013***	0.008***
Old dependency ratio	0.000	-0.014***	0.000	-0.014***	-0.004	-0.086***	0.000
Young dependency ratio	0.001**	0.023***	0.005***	0.037***	-0.040***	0.339***	0.002
Characteristics of household economic respondents							
Age	0.000	0.001***	0.000***	0.000	-0.002**	0.003***	0.000**
Squared age divided by 100	0.000	-0.002***	0.000***	-0.001***	0.001*	-0.005***	0.000
Female	0.000***	-0.007***	0.000***	-0.001	0.005	0.010***	0.002***
Attended school	0.001***	0.006***	0.003***	-0.001	0.017***	0.010**	0.008***
Having a degree	0.002***	0.003	0.006***	-0.010***	0.019**	0.009	0.020***
Employment status	0.000	0.002*	0.000**	-0.001	0.014***	0.011***	0.002**
Bad health dummy	0.000	0.002	-0.001***	-0.004***	0.003	0.014***	-0.005***
Hukou status	-0.003***	0.008***	-0.005***	0.006***	0.004	0.000	-0.012***
Marital status	0.000	-0.002	0.000	-0.002	0.006	0.008*	0.002***
Minority	-0.001**	0.022***	-0.001*	0.008***	-0.004	-0.008	-0.003**
Party membership	0.000***	0.003*	0.002***	0.000	0.009**	0.008**	0.004***
Number of observations	29357	29357	29357	29356	29356	29357	29313

Chapter 4

The Impact of Basic and Advanced Financial Literacy on Household Financial and Consumption Decisions: Evidence from China

4.1 Introduction and Motivation

Insights into the role of financial literacy are important to understand household decisions on allocating financial resources and balancing daily consumption. Financial literacy is regarded as one form of human capital that reflects households' capability to process large amounts of economic information and facilitates informed household choices (Lusardi and Mitchell, 2014; Huston, 2010; Jappelli and Padula, 2017). The concurrence of increasing financial complexity and more frequent participation in financial activities highlights the importance of financial literacy in making informed decisions with the mastery of basic financial concepts, including interest rates, inflation rates, risk diversification, and more (Frijns *et al.*, 2014; Klapper *et al.*, 2015; Lusardi and Tufano, 2015; Chu *et al.*, 2017).

With the rapid development of contemporary financial markets and financial technology, people are exposed to a complex investment environment in which financial literacy is required to perceive and understand a large number of financial products and services and is related to the ability to make decisions (Bucher-Koenen and Lusardi, 2011; Lusardi, 2019). Low financial literacy levels are closely associated with poor economic choices of decision-makers, thus potentially negatively influencing their well-being (Sekita *et al.*, 2022). There is an ongoing global trend that individuals are required to make more personal financial decisions (Anderson *et al.*, 2017; van Rooij *et al.*, 2011), among which purchasing houses and retirement planning are typically two of the most important (Hung *et al.*, 2009). In a complex financial world, it is unrealistic to posit that everyone is financially literate, and it is also impracticable to assume homogenous financial literacy for households with different educational backgrounds and at different stages of the life cycle (Allgood and Walstad, 2016).

Apart from the increasing diversity and complexity of financial products, in many countries, the changes in social systems shifting responsibilities of retirement planning from employers to employees are another important reason why financial literacy has become more important (Sekita *et al.*, 2022; Morgan

and Trinh, 2019). Previously, in the US, retired workers mainly entrusted their retirement accounts to old pension systems, which are composed of the Social Security (SS) benefits and the Defined Benefits (DB) accounts sponsored by employers; however, current retirees increasingly rely on the Defined Contribution (DC) accounts sponsored by employers and the Individual Retirement Accounts (IRAs) such as the 401(k) plans (Lusardi and Mitchell, 2014; Fajnzylber and Reyes, 2015).

In the UK, the 1986 Social Security Act and the 1995 Pensions Act alleviate the burden on the pay-as-you-go state system, accompanied by a marked drop in the public expenditures on pensions, and individual contributions play an important role in boosting pensions (Budd and Campbell, 1998; Taylor-Gooby, 1998). In order to ensure the sustainable development of pension systems, expanding private pension schemes as a supplementary part or reducing public spending are common practices (Taylor-Gooby, 1998).[31] This requires retirees to take more responsibility for financial decisions, like how much to save and invest for retirement (van Rooij *et al.*, 2012), thus influencing household portfolio choices.

The same reform happened in developing countries as well. In Chile, the traditional insolvent pay-as-you-go pension system was terminated in the 1980s and replaced by a new defined-contribution scheme called the Pension Fund Administrators (AFPs), which is nationally mandatory for new labour forces (Fajnzylber and Reyes, 2015).[32] In China, the traditional non-contributory pension system (the pay-as-you-go pension system) is thought to be unsustainable, especially in an ageing society, and in 1995 a mixed pension system with both the pay-as-you-go account from the social security account and the individual account from individual pre-retirement contributions was designed and confirmed to replace the old pension system (Zhu and Walker, 2018). With this trend, households are required to take more responsibility in managing the accumulation (e.g., investment) and decumulation (e.g., consumption) of their financial resources intertemporally.

[31] See Taylor-Gooby (1998) for the comparison of the pension reforms in the four European countries (the UK, Italy, France and Germany), concluding that these countries had to reform their pension system to deal with the pressures from huge social and demographic changes (e.g. the ageing population).
[32] All new workers are required to contribute at least 10% of monthly salaries to one selected defined contribution pension plan authorised by authorities (Behrman *et al.*, 2012).

Despite the cognition of the importance of household financial literacy, financial illiteracy is still widespread across countries (Lusardi and Mitchell, 2007a; Hilgert *et al.*, 2003; Christelis *et al.*, 2010; Lusardi and Mitchell, 2007c). As shown in Figure 4.1, there are huge differences in the share of financially literate households around the world based on a global survey with more than 150,000 respondents. Financially literate households refer to those who can correctly answer at least three out of these four financial literacy questions regarding numeracy, interest compounding, inflation and risk diversification, respectively. The top five in the ranking among 142 economies are Sweden, Norway, Denmark, Israel, and Canada. Chinese mainland ranks 98th, with only 28% of households correctly answering at least three out of four financial literacy questions (numeracy, interest compounding, inflation and risk diversification), which reflects the extremely low financial literacy levels of citizens living in the Chinese mainland (Hasler and Lusardi, 2017; Klapper *et al.*, 2015).[33] This sobering fact suggests that it is reasonable to relax the implicit assumption of previous works that all households have sufficient knowledge and skills required for making financial decisions (Jianjun Li *et al.*, 2020).

According to the consumers' financial literacy survey report released by the Financial Consumer Protection Bureau (FCPB) of the People's Bank of China (PBC) (the central bank of China), Chinese residents fall behind in the understanding of basic financial concepts such as risk diversification, and the financial literacy distribution presents an inverted-U shape with younger and older citizens having lower financial literacy levels (People's Bank of China, 2021). According to the report, financial literacy is higher among those with higher educational attainments and those with higher incomes. Gradually there are more empirical studies exploring the role of financial literacy in China. However, little research has dealt with the relationship between financial literacy and household consumption in China, not to mention the different roles of basic and advanced financial literacy in impacting household consumption.

[33] China includes mainland China (the Chinese mainland), Hong Kong Special Administrative Region (Hong Kong), Macao Special Administrative Region (Macao) and Taiwan province. Chinese mainland, Hong Kong, and Taiwan province are all included in the 2014 Standard & Poor's Global Financial Literacy Survey. Taiwan province ranks 62nd, and Hong Kong ranks 39th among participating economies.

This chapter aims to assess the effects of basic and advanced financial literacy on household economic decisions (such as savings, debt and consumption), above and beyond the traditional determinants of these outcomes, such as age, income and other demographic factors (e.g., gender, education and marital status). This chapter hypothesises that both basic and advanced financial literacy affect household holdings of liquid assets, household debt, and household consumption decisions. In detail, the following hypotheses are formulated:

H1: Basic financial literacy has a positive impact on household holdings and amounts of liquid assets, including cash and deposits.

H2: Basic financial literacy plays a positive role in determining household holdings and amounts of housing and non-housing debt.

H3: Basic financial literacy positively influences household consumption likelihood and amounts in different consumption categories.

H4: Advanced financial literacy has a positive impact on household holdings and amounts of liquid assets, including cash and deposits.

H5 Advanced financial literacy plays a positive role in determining household holdings and amounts of housing and non-housing debt.

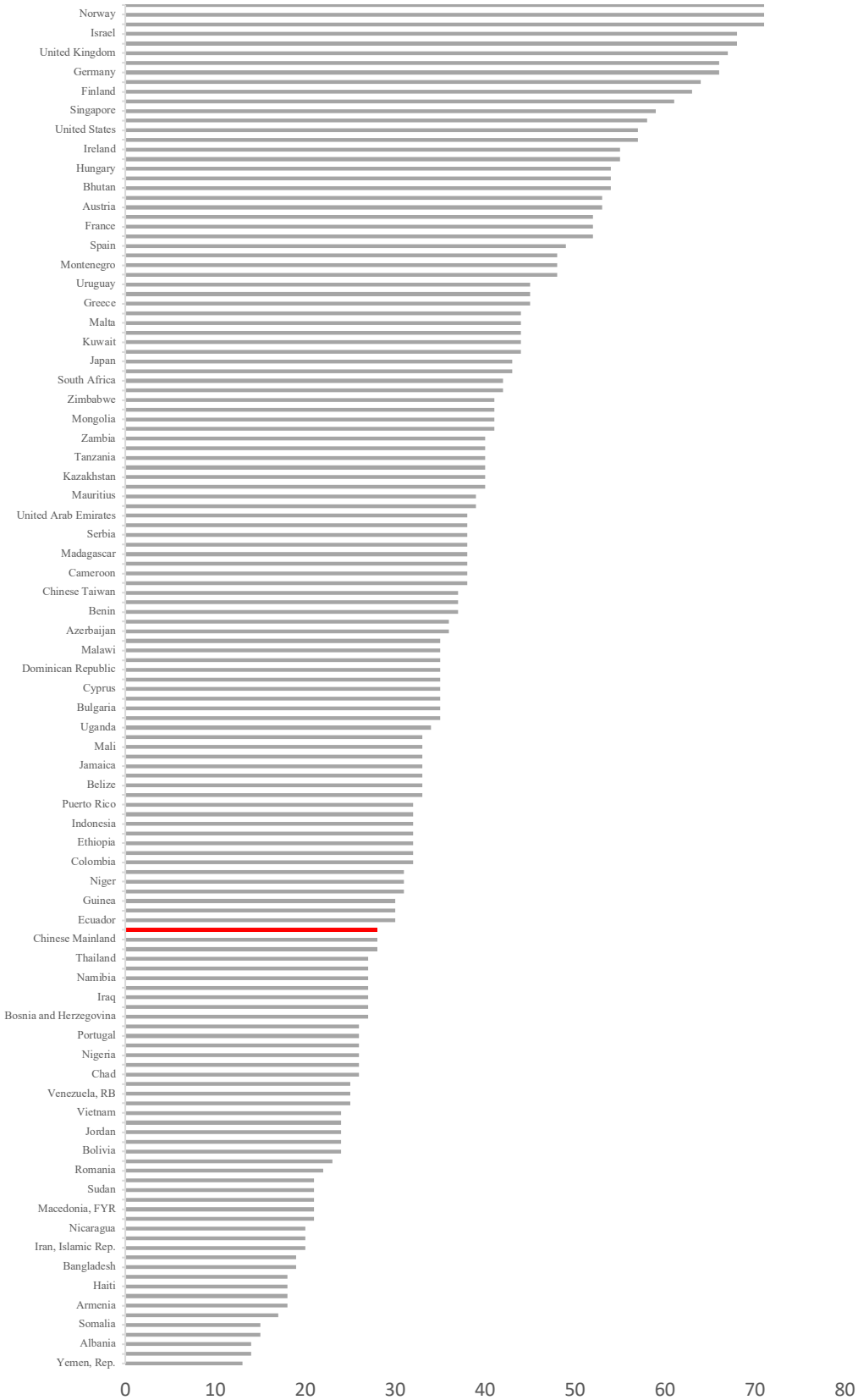
H6: Advanced financial literacy positively influences household consumption likelihood and amounts in different consumption categories.

Inspired by the theoretical models raised by Jappeli and Padula (2017) and Dinkova *et al.* (2021), this chapter is among the first to apply the theoretical framework linking financial literacy and consumption to study the household economic behaviour in developing countries (China in this chapter), providing more empirical evidence from an emerging market. The chapter also contributes to the existing literature by using both basic and advanced financial literacy in the empirical studies of emerging markets and

attempting to simultaneously utilise two different instruments to solve the endogeneity problem of basic and advanced financial literacy variables.

The remainder of this chapter is organised as follows. Section 3.2 reviews the existing literature from four aspects (introducing financial literacy, measuring financial literacy, the relationship between financial literacy and consumption, and the endogeneity problem of financial literacy). Section 3.3 describes data and variables in detail. Section 3.4 presents empirical strategies and the estimation results. Finally, section 3.5 concludes.

Figure 4.1 Percentage of financially literate adults for each economy



Source: The 2014 Standard & Poor's Global Financial Literacy Survey (Klapper *et al.*, 2015)

4.2 Literature Review

4.2.1 Introducing financial literacy

John Adams is regarded as the "father" of financial literacy, who acknowledged the significance of knowledge regarding money for the first time in 1787; however, the research subject of financial literacy emerged in the late 1990s (Goyal and Kumar, 2021). After reviewing more than 500 peer-reviewed articles on financial literacy, Goyal and Kumar find no consistent definition in the existing literature. Learning from the framework of defining literacy by the Educational Testing Service (ETS), Huston (2010) conceptualises financial literacy with two dimensions: the knowledge dimension (financial knowledge) and the application dimension.

Generally, financial literacy refers to two aspects, financial knowledge and financial capabilities. Financial knowledge ranges from basic financial concepts, e.g. interest compounding, inflation and risk diversification (Lusardi and Mitchell, 2011b), to any knowledge relating to personal finance, e.g. the knowledge of financial products and mathematical skills necessary for making financial decisions (Huston, 2010; Hastings *et al.*, 2013). At the same time, financial capabilities refer to the ability to use or apply that knowledge (Sherraden, 2013) to allocate financial resources and discover investment opportunities (Hung *et al.*, 2009).[34] In the literature, financial literacy, financial knowledge and financial capabilities can be used interchangeably, depending on the definition and constructs of financial literacy (e.g. Huston, 2010; Lind *et al.*, 2020).

Financial literacy is reflected in specific behaviours of financially literate people (Atkinson and Messy, 2012; Goyal and Kumar, 2021; Klapper *et al.*, 2013). Considering extreme scenarios where people have

[34] There are two types of financial capabilities defined in Sherraden (2013): the internal financial capabilities (individuals' "ability to act") and the external financial capabilities (the "opportunity to act"). The former is associated with people's knowledge, skills, abilities and more of personal finance, and the latter emphasizes external financial conditions (e.g., access to financial products and services). Sherraden (2013) points out that in the context of financial literacy, financial capabilities commonly refer to the internal individuals' knowledge, skills, and ability, providing that the external conditions do not change.

no or little basic financial knowledge, the dominating strategy would be the simple heuristic "rules of thumb" methods (Bernheim *et al.*, 2001; Bernheim, 1996). Because it is costly to acquire and accumulate cognitive knowledge and skills required for a completely-informed decision, a rule-of-thumb strategy turns out to be advantageous compared with a rationally informed decision due to cognitive scarcity (D'Orlando and Sanfilippo, 2010; Baumol and Quandt, 1964). The parsimonious rules of thumb (e.g. a percentage of income) provide a rough guide about savings and consumption as a suboptimal substitute for the dynamic intertemporal optimisation models (Winter *et al.*, 2012; Allen and Carroll, 2001).

When the universal rule of thumb is not tailored for specific demographic groups (e.g. low-income households), the rules of thumb may discourage households from performing financially sound practices when the savings expectation informed by the rules of thumb is considered unattainable (Jain, 2009). Households need to distinguish good rules from bad rules via repeated trials and errors (the learning-by-doing processes) and then anchor a reasonable savings goal over the lifetime (Allen and Carroll, 2001). The authors also highlight that more financial experience and relevant financial education help households choose the optimal rule of thumb.

The rule-of-thumb method can partially explain the phenomenon that households with lower retirement income replacement rates experience more serious consumption discontinuity (the decline of consumption) at retirement, revealing that households fail to smooth lifetime consumption using savings, contrary to the tenet of saving to smooth consumption depicted by the conventional life cycle theory (Bernheim *et al.*, 2001).[35] Besides, empirical survey evidence supports that many adults have

[35] The income replacement rates are used to proxy the retirement income adequacy, which is the ratio of retirement income (e.g. pensions and social security benefits) to pre-retirement income (Purcell, 2012). Bernheim, Skinner and Weinberg (2001) calculate the income replacement ratios by dividing post-retirement non-asset income (including pensions, social security benefits, transfer income, and earnings) by pre-retirement non-asset income over an identical time horizon of three years. The authors also calculate the wealth ratio (the asset counterpart). The consumption discontinuities after retirement exist across all income replacement and wealth quartiles, with respondents in the lowest quartile experiencing the most significant decline. Assuming that the discontinuity of post-retirement income is predictable, Bernheim, Skinner and Weinberg (2001) conclude that not all respondents do rational farsighted planning and provide two potential reasons: (1) they use the rule-of-thumb principles to

insufficient savings for retirement and even no retirement plan (Lusardi and Mitchell, 2007a, 2007b, 2007c), especially households with female heads (Fajnzylber and Reyes, 2015).

In order to smooth consumption over the life cycle, the traditional life cycle model with certainty posits that it is important for households to accumulate more net wealth before retirement, mainly via pension systems or savings, in preparation for the decumulation of wealth after retirement (Behrman *et al.*, 2012; van Rooij *et al.*, 2012). van Rooij *et al.* (2012) summarise the reasons for the violation of the simple-form life cycle consumption model. These factors include precautious motives, bequests, major events over a lifetime and more. However, they emphasise that financially literate individuals are more able to collect and proceed financial information and are sophisticated in managing savings and consumption, which is ignored in earlier studies.

Financial literacy has a positive effect on household wealth accumulation (van Rooij *et al.*, 2012). For example, using the Chilean Social Protection Survey, Behrman *et al.* (2010, 2012) find that financial literacy is positively associated with wealth accumulation (both total net wealth and its components) and pension contributions (pension savings or the fraction of pension contributions). The estimated results indicate a stronger effect of financial literacy with instrumental variables controlling for omitted variable biases and measurement error biases. Substantial evidence supports that financial literacy plays a positive role in retirement planning (Almenberg and Save-Soderbergh, 2011; van Rooij *et al.*, 2011).

More financially literate households are more willing to invest in risky assets and choose more diverse portfolios, while financially illiterate participants tend to make more conservative and inefficient decisions (Calvet *et al.*, 2007; Herispon, 2019). People with higher financial literacy levels have a better understanding of different financial tools in financial markets, such as stocks, bonds, and funds, thus having better access to financial markets (Li and Qian, 2020). On average, more literate households

make adjustments to savings and consumption behaviours when facing positive or negative shocks (i.e. near retirement) and (2) they psychologically prefer spending current income following the mental accounting theories, differing in the degree of the urge.

have higher returns on their portfolio (Bianchi, 2018). On the one hand, they are more willing to have risker positions (e.g. participating in the stock market) in their portfolios with higher expected returns (Bianchi, 2018; Zheng *et al.*, 2021) and more diversified portfolios, e.g. more different assets in the portfolios (Abreu and Mendes, 2010). On the other hand, they rebalance their portfolios more frequently to adjust their risk exposures systematically in response to the changes in external conditions and their historical performances for higher returns (Bianchi, 2018).

In the context of China, based on the data from the China Household Finance Survey (CHFS) datasets, Lu *et al.* (2021) find that households with higher financial literacy perform better in household asset allocation partially because they collect and understand relevant economic information and are more willing to seek professional financial advice, especially for those with higher wealth or education. Li *et al.* (2020) use another nationally representative dataset, the China Family Panel Studies (CFPS), finding that financial literacy significantly increases the likelihood of holding risky assets and the proportion of risky assets in household portfolios. Households with higher financial literacy have better abilities to understand and compare different financial products, thus influencing their decision-making. Besides, they also find that the effects of financial literacy are different for households of different ages and educational backgrounds.

As discussed above, improved financial literacy is beneficial to household decision-making. Correspondingly, financial illiteracy results in inefficiency and higher costs when making financial decisions. Campbell (2006) points out that households with lower wealth and less education are more likely to make financial mistakes (e.g. nonparticipation of risk assets and under-diversification of their household portfolios) than their counterpart. Chu *et al.* (2017) point out that the adverse outcomes of low financial literacy are reflected in many aspects of financial decisions, resulting in lower welfare. Financially illiterate households make pension and saving decisions based on their limited and incorrect knowledge about pensions (Chan and Stevens, 2008). They also make suboptimal borrowing decisions for loans and mortgages with higher fees and costs (Lusardi and Tufano, 2015). Compared with more literate households, they lack the knowledge and skills required in household asset allocation (Von

Gaudecker, 2015). At the same time, they are not actively seeking external financial advice, resulting in many adverse outcomes; for instance, under-diversification (Von Gaudecker, 2015).

4.2.2 Measuring financial literacy

In line with different conceptual definitions, diverse methods of measuring financial literacy are adopted in empirical studies. The outcomes of different methods have evolved into two major branches: the objective financial literacy captured by performance tests and the subjective financial literacy self-assessed by respondents (Hung *et al.*, 2009). The former is based on whether respondents correctly answer each question of objective financial literacy surveys, while the latter is derived from one or several items pertaining to self-assessments or self-rating of personal financial literacy perceived by respondents (Allgood and Walstad, 2016; Lind *et al.*, 2020). These two types of financial literacy provide two different insights and dimensions for the empirical research of financial literacy.

Regarding objective financial literacy, it is important to determine the financial questions to be included before constructing the variable. The two most common combinations of financial literacy questions are (1) the Big Three questions (see Table 4.1), which appeared in the 2004 Health and Retirement Study (HRS) of the US and developed by Lusardi and Mitchell (2008, 2009, 2011a, 2011c); and (2) the Big Five questions containing the Big Three questions and adding two extra questions.[36] The three questions in the financial literacy module of the 2004 HRS survey is known as the Big Three questions because the combination of these three foundational questions has become the benchmark for designing financial literacy questions (Hastings *et al.*, 2013).[37] The parsimony and popularity of the Big Three

[36] In the 2009 National Financial Capability Study (NFCS) for the US, the two additional questions are about mortgage interests with different terms and the relationship between interest rates and bond prices (Hastings *et al.*, 2013).

[37] There are many other datasets adopting the Big Three questions apart from the HRS and the NFCS for the US, including the DNB Household Survey (DHS) for the Netherlands, the Survey of Living Preferences and Satisfaction (SLPS) for Japan, the SAVE panel for Germany, the Encuesta de Prevision Social (EPS) survey for Chile and the EERA for Mexico (Hastings *et al.*, 2013).

questions make it possible to make comparisons between different countries (Hastings *et al.*, 2013; Lusardi, 2019).

Table 4.1 The Big Three questions in the 2004 Health and Retirement Study

Category	Original description of each question
Interest compounding	"Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, less than $102?"
Inflation	"Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?"
Risk diversification	"Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund."

Note: The information is derived from Lusardi and Mitchell (2011a).

After reviewing the existing literature on financial literacy between 2000 and 2010, Huston (2010) concludes that there are four main types of questions used for measuring financial literacy: basics of money (e.g. time value of money and purchasing power), borrowing (e.g. credit cards, loans or mortgages), investing (e.g. savings, stocks, bonds and funds) and risks (e.g. risk management). Meanwhile, Huston (2010) summarises that the number of financial literacy questions ranges from 3 to 68, with a mean of 16 and a median of 13. The questions included in a questionnaire are usually multiple-choice questions or true-false questions (Allgood and Walstad, 2016).

After collecting the responses to questions regarding financial literacy, the core is how to construct the financial literacy variables using the answers to indicate respondents' financial literacy levels. There is no standardised and consistent method of measuring financial literacy (Hung *et al.*, 2009; Huston, 2010;

Lusardi and Mitchell, 2014). After exploring eighteen empirical studies regarding financial literacy, the conventional and predominant approach is to calculate the number of questions answered correctly by assigning each correct answer one score (Bianchi, 2018) or the percentage of correct answers (Hung *et al.*, 2009). A similar approach is subtracting the average number of correct responses from the number of questions correctly answered and then dividing the deviation from the mean by the number of financial questions, resulting in a summary index centred on zero (Lusardi *et al.*, 2014).

The aforementioned methods have the obvious disadvantage of assigning equal weight to each question, which ignores the intrinsic distinctions (e.g. difficulty, importance, and the amount of information included) among questions, especially when the number of questions is large (Behrman *et al.*, 2010; Lusardi *et al.*, 2014). To compensate, the principal component analysis method (or the factor analysis method) is used to calculate financial literacy, allocating different weights to each financial literacy question (Tang and Jiang, 2021; Letkiewicz and Fox, 2014; Lusardi and Mitchell, 2009). For example, van Rooij *et al.* (2011) use a factor analysis with the iterated principal factor method by assigning different factor loadings after constructing a dummy variable for each question, with one indicating that respondents answered the question correctly and zero otherwise. In order to get robust results, Li and Qian (2020) adopt both the simple additive method and the principal component analysis to construct two alternative and comparable financial literacy variables.

Behrman *et al.* (2010, 2012) apply another creative technique to assign different weights to different financial literacy questions, which is called the principle component analysis of RIDIT scores (PRIDIT) developed by Brockett *et al.* (2002), combining the principle component analysis approach and the RIDIT scoring system.[38] There are two consecutive steps in this weighting scheme: (1) generating the RIDIT scores for each question by difficulty in the first step with higher penalties for an incorrect answer provided by a larger proportion of the sample respondents and higher rewards for a correct

[38] The RIDIT scoring system is the abbreviation of the Relative To An Identified Distribution Transformation system (Golden and Brockett, 1987). Both the RIDIT and PRIDIT techniques are suitable for proxying binary or categorical variables, which are difficult to be observed and measured for research (Golden and Brockett, 1987; Brockett *et al.*, 2002; Lusardi *et al.*, 2014).

response of fewer respondents within the sample, taking account of the difficulty of each question; and (2) using the principle components analysis taking the correlations across questions into account to select the principle component vector capturing the largest degree of variation, signalling the PRIDIT weights to each component used to construct the latent financial literacy index (Behrman *et al.*, 2010, 2012; Lusardi *et al.*, 2014; Lieberthal and Comer, 2013).

The final PRIDIT scores of the three basic financial literacy questions (0.64 for percentage calculation, 0.59 for lottery division and 0.59 for interesting compounding), in accordance with the design of the HRS financial literacy module, are larger than those of other questions, ranging from 0.29 to 0.58, signalling the importance of the core three questions. The PRIDIT financial literacy measure is obviously more practical in selecting and identifying more informative and more difficult questions; however, the results show that the PRIDIT financial literacy variable is highly correlated with a simple additive financial literacy at 0.977 (Lusardi *et al.*, 2014) or a simple percentage index of financial literacy (Behrman *et al.*, 2010), and what is more, the empirical results using either the simple equally-weighted financial literacy or the unequally-weighted one are similar (Behrman *et al.*, 2010).

Financial literacy is usually a relatively broad concept. In order to examine the heterogeneous effects of different aspects of financial literacy, some researchers try to disaggregate general financial literacy into different components representing different types of financial literacy and develop corresponding metrics for measuring the subcategories (Sekita *et al.*, 2022; Behrman *et al.*, 2012, 2010). Behrman *et al.* (2010, 2012) use twelve questions to form the overall financial literacy and then decompose it into three categories: (1) the basic category with three questions, in compliance with the three questions in the Health and Retirement Study (HRS) of the US developed by Lusardi and Mitchell (2007c), for the concepts of percentage, lottery division and interest compounding respectively; (2) the advanced category with three questions regarding interest compounding, inflation and risk diversification following the questions in a special module of the HRS introduced in Lusardi and Mitchell (2009); and (3) the pension financial literacy derived from six pension-related literacy questions (including the percentage of individual monthly contributions mandatorily deducted from income, men's retirement

age, women's retirement age, pension calculation, the state-guaranteed part of pensions, and the newly-introduced Voluntary Pension Savings system), uniquely contained in the Chilean Social Protection Survey.[39]

After realising that there are many other dimensions of financial literacy apart from pension literacy, researchers start to innovate in measuring financial literacy, serving more specific and diverse fields of financial decisions. For example, Lusardi and Tufano (2015) conducted a national survey regarding debt literacy in the US, specifically focusing on respondents' knowledge of debt concepts, with three questions about using credit cards. The three questions about borrowing and debt behaviour are related to the interest rate of credit cards, the working of credit cards, and the choice between different repayment methods.

With the global popularity of digital financial services, digital financial literacy, namely the knowledge and skills required to use digital devices and perform digital financial activities, attracts attention due to its impacts on financial decision-making (Lyons *et al.*, 2020; Jünger and Mietzner, 2020; Carlin *et al.*, 2019). Plotting the percentage of the digitally literate population against the percentage of the financially literate population across 24 countries, Prete (2022) finds a positive relationship between digital literacy and financial literacy across countries and highlights that the level of digital literacy is on average much lower than that of financial literacy across countries. The empirical results of Prete (2022) suggest that both digital and financial literacy have negative and significant impacts on the amount of cash and deposits that households hold, but only financial literacy positively impacts pension fund accumulation.

Generally, it is an innovation to measure financial literacy using different strategies. However, it brings new challenges related to the measurement of financial literacy, especially the newly added

[39] It is obvious that interest compounding is included in both the basic and advanced financial literacy question sets. However, in the basic part, respondents are asked to choose one from multiple options (i.e., more than 120 dollars, exactly 120 dollars, and less than 120 dollars). Comparatively, for advanced financial literacy, the interest-compounding question asks respondents to provide an exact answer, which is more complicated.

supplementary parts. Take digital literacy as an example, Kass-Hanna *et al.* (2021) attempt to construct a composite variable containing all items, including five objective financial literacy questions, one subjective financial literacy question and fifteen digital literacy questions, which theoretically range from 0 to 21, using the InterMedia Financial Inclusion Insights (FII) datasets. After obtaining this composite variable, all financial or digital literacy indexes are standardised, equalling the difference between actual values and the mean divided by the standard deviation of each variable (the z value). The new standardised variables are positive and statistically significant, indicating that both financial and digital literacy positively impact respondents' savings behaviour (having savings in banking institutions, nonbanking institutions or both), borrowing behaviour (having loans with banks, non-bank financial institutions or both), and risk management behaviour (having life insurances, health insurance, or emergency funds).

Besides, there is another innovative method of refining the measurement of general financial literacy rather than its branches (e.g., pension literacy, debt literacy and digital literacy). This method introduces two financial literacy indicators: basic and advanced financial literacy. Lusardi and Mitchell (2009) propose the comprehensive method of using two sets of financial literacy questions to capture both types of questions, with the first set of questions collecting information about basic financial literacy concepts (i.e. interest compounding, inflation and the time value of money) and the second set of questions capture more sophisticated financial literacy questions mainly regarding the participation of financial markets. This chapter employs this method to construct financial literacy variables.

Specifically, in the empirical part of Lusardi and Mitchell (2009), the authors use the data from the RAND American Life Panel (ALP), which has a particular financial literacy module designed to collect financial literacy information with five questions for basic financial literacy and eight questions for advanced financial literacy (Lusardi and Mitchell, 2009). The five questions, designed for capturing respondents' understanding of basic concepts, are regarding numeracy, interest compounding, inflation rates, the time value of money, and the money illusion (the purchasing power of money when your income and the prices of all goods are simultaneously doubled), respectively. The eight sophisticated

questions are about (1) the main function of stock markets, (2) the knowledge of mutual funds, (3) the relationship between interest rates and bond prices, (4) a comparison of the risks of stocks and mutual funds, (5) comparison of the risks of stocks and bonds, (6) comparison of the return rates of different financial products, (7) comparison of the volatilities of different financial products, and (8) risk diversification.

van Rooij *et al.* (2011) design and use two financial literacy modules of the 2005 DNB (De Nederlandsche Bank) Household Survey (DHS) to measure the financial literacy of participants. The basic parts of both Lusardi and Mitchell (2009) and van Rooij *et al.* (2011) follow the design of financial literacy questions in the HRS, using five questions testing identical basic aspects of day-to-day financial decisions. However, in the advanced financial literacy module, van Rooij *et al.* (2011) add three additional questions, one question about the implications of owning the stock of one company, one question about the implications of owning bonds of firms, and one question about the judgement of the statement of bonds (whether the owners of bonds can sell them before the maturity of bonds without incurring major penalties). Then a factor analysis is used to measure financial literacy, assigning different factor loadings to different questions.

Turning to subjective financial literacy, subjective measures mainly provide information on how respondents assess their personal financial knowledge and capability, which are inevitably subject to cognitive biases (e.g. overconfident biases) (Lusardi and Mitchell, 2014). Many empirical studies use both measures, the actual financial literacy and the perceived financial literacy, in one model or separate models, to investigate the effects of financial literacy on different financial behaviours (i.e., Allgood and Walstad, 2016). Allgood and Walstad (2016) find that, regardless of the actual financial literacy, a unit increase in subjective financial literacy scores significantly exerts a positive marginal effect on financial outcomes. It is worth noting that subjective financial literacy is not simply a proxy for objective financial literacy (Allgood and Walstad, 2016). The coefficients in the last column in Appendix 4.1 illustrate that actual financial literacy positively correlates with subjective financial

literacy, but the correlation is not strong. This finding is consistent with the conclusion of Parker *et al.* (2012).

Some empirical studies include objective and subjective financial literacy for comparison. The inclusion of both objective and subjective financial literacy effectively addresses some concerns that the measures of financial literacy are sensitive to the design and framing of questionnaire questions (Lusardi and Mitchell, 2014; Kass-Hanna *et al.*, 2021; Lyons *et al.*, 2021). For example, subjective financial literacy, compared with objective financial literacy, is a better and stronger predictor of savings behaviour (Anderson *et al.*, 2017) and sound financial behaviours (e.g. paying bills/credit card balance on time, recording monthly expenses, purchasing within budgets, saving for long-term goals, making retirement plans, and making finance plans) (Lind *et al.*, 2020). When the inclusion of both types of financial literacy, separately or simultaneously, brings similar conclusions, the results are more convincing (Kass-Hanna *et al.*, 2021).

With comprehensive information on objective and subjective financial literacy, it is possible to develop a new branch of financial literacy studies, discussing the role of overconfidence or under-confidence in financial decisions and behaviours. Individuals are thought to be overconfident (underconfident) when their subjective financial literacy is high (low) while their objective financial literacy is comparatively low (high), considering the perceived financial literacy reflects their confidence and the actual financial literacy proxies their actual financial competence (Lind *et al.*, 2020). From a psychological point of view, confidence in a certain ability will greatly promote motivation to participate in related activities requiring that ability (Bénabou and Tirole, 2002).

Based on the objective (subjective) financial literacy indicators, households scored above the average level are considered to be households with high objective (subjective) financial literacy levels and otherwise are considered to be households with low objective (subjective) financial literacy levels. Afterwards, households with high objective and low subjective financial literacy are categorised to be underconfident, and households with low objective and high subjective financial literacy are

overconfident (Allgood and Walstad, 2013; Xia *et al.*, 2014; Chu *et al.*, 2017). The disadvantage of this method is that it cannot measure the degree of overconfidence or under-confidence (Huang *et al.*, 2020).

To overcome this shortcoming, the literature has proposed some alternative methods. One is to use the residuals of the regression of the subjective financial literacy on the objective financial literacy to proxy the overconfidence and under-confidence (Bannier and Schwarz, 2018). Another method is to standardise both objective and subjective financial literacy, and the difference between the standardised ones is treated as an indicator of overconfidence (Khan *et al.*, 2017). Referring to the work of van Rooij *et al.* (2012), in order to make these two types of financial literacy comparable, Huang *et al.* (2020) artificially rescale the objective financial literacy, to make both metrics have the same scale, and the difference between them is treated as the overconfidence (or under-confidence) indicator.

Overconfident people may make financial decisions deviating from the optimal choice without self-awareness because they are more miscalibrated about their actual competence in financial literacy (Anderson *et al.*, 2017). The empirical evidence also shows that overconfident individuals are less willing to accept professional financial advice (Porto and Xiao, 2016), thus making it more difficult to intervene in their financial decisions via financial education and financial consultation services (Anderson *et al.*, 2017). They are reluctant to seek external help for their financial decisions because individuals with erroneous confidence excessively trust their abilities (Von Gaudecker, 2015). Overconfidence in their financial knowledge and financial behaviours prevents decision-makers from making better investment decisions (Li and Qian, 2021).

4.2.3 Financial literacy and household consumption

There are two important classical theories that can be used to explain the consumption behaviours of individuals and households: the traditional life-cycle consumption models and the Keynesian consumption theory. Modigliani and Cao (2004) point out that the life cycle hypothesis is suitable for analysing household behaviour (e.g., savings) in developed economies, while the Keynesian theory is relevant to households in low-income economies. Both the life-cycle model developed by Modigliani and Brumberg (1954) and the permanent income hypothesis proposed by Friedman (1957) assign more importance to the intertemporal utility maximisation behaviour (D'Orlando and Sanfilippo, 2010; Lusardi and Mitchell, 2009). The permanent income hypothesis posits that households determine their current consumption based on their predictions of lifetime income rather than their current disposable income, thus smoothing marginal utility over time (Hall, 1978; Ziliak, 1998). Therefore, the incentive of substituting consumption over time, closely related to the expected real interest rate, influences households' consumption decisions; that is, the expected increase in real interest rates induces the decrease in current consumption as a response to the demand shocks (Jappelli and Padula, 2017).

The life-cycle and permanent income hypotheses assume that participants have the knowledge and skills to deal with complex financial markets, thus formulating and implementing savings and consumption plans, but the reality is that few people have sufficient financial knowledge (Lusardi and Mitchell, 2014). Therefore, it is reasonable to endogenise financial literacy to relax the assumption of complete rationality and homogenous well-informed individuals. Given the elasticity of intertemporal consumption substitution (consumers' preferences), Jappeli and Padula (2017) endogenise financial literacy into a multi-period consumption model with the standard consumption Euler equation through the return rate, and conclude that consumption growth is positively related to financial literacy when the interest rate factor (or the gross return rate) is a function of financial literacy.[40] This model is built

[40] In Jappeli and Padula (2017), the standard consumption Euler equation is expressed as

$$u'(c_t) = \beta f(FL) E_t u'(c_{t+1})$$

on the existing finding that households with higher financial literacy tend to have higher return rates (see e.g., Chu *et al.*, 2017). This mechanism relaxes the assumption of constant interest rates in the life-cycle model developed by Lugauer, Ni and Yin (2019).

Dinkova *et al.* (2021) point out that, before their research, the study of Jappelli and Padula (2017) is the only study that directly links financial literacy to consumption. Following the method of Jappeli and Padula (2017), Dinkova *et al.* (2021) build a life-cycle model as a theoretical basis for their empirical studies, including financial literacy through the interest rate variable, which is a function of financial literacy. The reasoning behind this is that there is a positive relationship between financial literacy and return rates; thus, households with a higher financial literacy level are assumed to perform better with higher return rates (Dinkova *et al.*, 2021). In the model settings, the authors also make several assumptions to develop a feasible model shedding light on the relationship between household consumption and financial literacy. These assumptions are (1) complete certainty, excluding the interference from risk aversion and other factors, (2) perfect capital markets, with no liquidity constraints excluding the lagged income terms, (3) no income growth, with household income constant over time, (4) no bequest motive, with the wealth starting from zero in the beginning and returning to zero at the end of the life cycle, (5) the constant relative risk aversion utility function, (6) exogenous financial literacy variables, and (7) a positive intertemporal elasticity of consumption substitution.

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where c_t and c_{c+1} stand for the consumption at time t and the consumption at time $t+1$ respectively; the $u(\cdot)$ function is the utility function; β is the discount rate; FL is the level of financial literacy; and $E_t(\cdot)$ is an expectation function at time t. Introducing financial literacy into the value function, we can get

$$V_t(A_t, FL) = \max_{\{c_t\}} [u(c_t) + \beta E_t V_{t+1}(A_{t+1}, FL)]$$

where $V_t(\cdot)$ and $V_{t+1}(\cdot)$ are the value function at time t and time $t+1$ respectively; c_t and c_{c+1} stand for the wealth at time t and the consumption at $t+1$ respectively. The consumption decision is based on the consumption level of maximising the value function. The relationship between consumption growth and financial literacy is expressed as follows.

$$\Delta \ln c_{t+1} = \sigma \ln \beta + \sigma \ln f(FL) + \varepsilon_{t+1}$$

where σ is a factor representing the elasticity of intertemporal consumption substitution (consumers' preferences) and ε_{t+1} is an aggregate disturbance term. There are two factors in this relationship: the consumer preferences factor σ and the discount factor for multiple periods β. Given the two factors, it is obvious that there is a positive relationship between consumption growth on the left-hand side of this equation and financial literacy on the right-hand side of the equation. For more details and the derivation of the consumption Euler equation and the solution, see Jappeli and Padula (2017).

Under these assumptions, the life-cycle consumption model of Dinkova *et al.* (2021) provides that consumption growth is approximated by the product of the intertemporal elasticity of consumption substitution and the difference between the return rate and the discount rate. The positive substitution elasticity reflects the willingness to postpone current consumption into the future when the return rate is high enough to exceed the discount rate due to time preferences. Because the return rate is a function of financial literacy, households with higher financial literacy have higher return rates and then higher consumption growth, given their intertemporal consumption and time preferences. Furthermore, the simulation results of the model also reveal that, under the presupposition, life-cycle consumption increases with age (the consumption profiles) when the substitution elasticity of consumption is ranged from 0.4 to 0.8 suggested by the existing literature. The steepness of the simulated consumption profile curves increases with financial literacy (reflected in the return rates) and the willingness to postpone current consumption into the future (reflected in the intertemporal consumption substitution coefficients).

Based on the theoretical models, Jappelli and Padula (2017) and Dinkova *et al.* (2021) also provide empirical evidence to support their conclusions. Jappelli and Padula (2017) use the biannual representative Italian Survey of Household Income and Wealth (SHIW), which contains a financial literacy module with three financial literacy questions (i.e., distinguishing fixed-rate and floating-rate mortgages, the purchasing power given a deposit interest rate and a relatively higher inflation rate, and risk diversification). The empirical evidence with the introduction of instrumental variables first corroborates that it is reasonable to assume financial literacy enters the life-cycle model through the return rate because financial literacy is indeed correlated with household portfolio performance. Next, they find a positive relationship between consumption growth and financial literacy, especially for households with more wealth, taking into account household borrowing constraints.

The analysis of Jappelli and Padula (2017) is restricted to the relationship between consumption growth and financial literacy. Motivated and inspired by the work of Jappelli and Padula (2017), Dinkova *et al.* (2021) extend their findings in the framework of a life-cycle consumption model to demonstrate the

relationship between consumption (growth) and financial literacy, using the LISS panel data for the Netherlands. Dinkova *et al.* (2021) include both subjective financial literacy scaled from 1 to 5 and objective financial literacy measured as the number of correct answers among four financial literacy questions (i.e., the Big Three questions, and the relationship between bond prices and interest rates), with food consumption, total nondurable consumption, consumption growth as dependent variables.

Compared with the results of Jappelli and Padula (2017), the empirical results of Dinkova *et al.* (2021) are more diverse but not consistent across different age groups and different types of households (e.g. single households and couple households). First, the empirical evidence suggests a strong association between objective financial literacy and food consumption for all types of households, but there is no relationship for subjective financial literacy. Second, turning to nondurable consumption, the positive relationship between financial literacy and nondurable consumption only exists for couple households and single female households. Third, the sensitivity checks show that the roles of objective and subjective financial literacy differ for younger households that are financially constrained and older households with less income uncertainty. The heterogeneous effects of financial literacy are consistent with the findings of Koomson *et al.* (2021). Fourth, different from the conclusion of Jappelli and Padula (2017), the estimation results related to the Euler equation show that there is no relationship between consumption growth and financial literacy. Furthermore, the authors emphasise that the results of this work only reveal the relationship between consumption (growth) and financial literacy, rather than the causality, and the endogeneity problem cannot be neglected in the research regarding financial literacy.

Another theory is the Keynesian consumption theory assuming individuals' consumption is determined by their contemporaneous income; that is, household consumption is closely related to household income (Cao *et al.*, 2021; D'Orlando and Sanfilippo, 2010; Modigliani and Cao, 2004). In the Keynesian system, household consumption and the marginal propensity to consume are basically determined by current income, which is totally different from the life-cycle models in the intertemporal utility maximising framework (Drakopoulos, 2021). Without the rational maximisation processes, the Keynesian framework emphasises the importance of irrational and psychological processes, the so-

called animal spirits, which are important for investigating psychological biases in making economic decisions (Drakopoulos, 2021; Aggarwal, 2014).

Based on the existing literature exploring the psychological factors influencing individuals' consumption decisions, D'Orlando and Sanfilippo (2010) find there are some major psychological factors related to household consumption, including procrastination behaviours (leading to insufficient precautious savings and higher consumption), cognitive capability, mental myopia (being short-sighted as an important determinant of over-consumption), mental accounting (having different mental accounts for different types of consumption with limited fungibility), and debt aversion. The cognitive ability (i.e. the calculation capability) reflects people's knowledge and skills required to make informed choices, including consumption decisions (D'Orlando and Sanfilippo, 2010). Similar to cognitive capability, financial literacy is one psychological factor determining household decisions.

Theoretically, financial literacy may influence households' consumption decisions in the Keynesian framework as one inherent characteristic. For example, short-sighted households may choose a rule-of-thumb strategy to determine their consumption by self-control considerations (i.e. controlling credit card balances below a certain percentage of the limit) rather than smoothing consumption over the lifetime (Bertaut and Haliassos, 2005). In China, based on the 2015 China Household Finance Survey (CHFS), Tang and Jiang (2021) use factor analysis to construct a composite financial literacy indicator. The estimation results show that households with higher financial literacy are more likely to consume luxuries, tourism and education, keeping other controls constant.

Zhang *et al.* (2021) also use the data from the China Household Finance Survey (CHFS), exploiting the difference-in-difference method to study household consumption after experiencing exogenous income or wealth shocks (i.e., the Chinese stock market crash of the year 2015). The empirical estimation results show that households with higher financial literacy experience a smaller decline in consumption measured as a fraction (e.g. 4.78% for the lowest quartile and lower for the higher quartiles), reflecting a smoother consumption strategy facing external shocks. Li *et al.* (2020) and Lu *et al.* (2021) do not

directly examine the relationship between financial literacy and household consumption but provide relevant evidence to support that improved financial literacy can promote household consumption.

Jappeli and Padula (2017) and Dinkova *et al.* (2021) are among the earliest studies exploring the relationship between financial literacy and household consumption from a theoretical perspective. Within their framework, financial literacy determines the return rates of household portfolios, thus positively influencing household consumption behaviours. Household preferences are measured by the intertemporal elasticities in consumption, reflecting household willingness when substituting current consumption with future consumption toward the changes of interest rates. Jappeli and Padula (2017) find the elasticity of intertemporal substitution in Italy is ranged between 0.4 and 0.6, under the assumptions of complete certainty, constant household income, and a fixed intertemporal elasticity in consumption.

The steepness of consumption profiles reflects the willingness to sacrifice current consumption for future consumption given a positive intertemporal elasticity of substitution (Dinkova *et al.*, 2021). Durable consumption is more responsive to changes of real interest rates than non-durable consumption (Fauvel & Samson 1991). This indicates that the intertemporal elasticities in consumption are likely to vary for various consumption categories. Xie *et al.* (2024) find that the estimated parameters of financial literacy for hedonic consumption (e.g. education and entertainment consumption) are greater than those for subsistence consumption (e.g. food consumption and clothing consumption) in magnitude when all financial literacy parameters are estimated to be positive.

4.2.4 The impacts of financial literacy on liquid assets and debt decisions

Different from the link between financial literacy and household consumption decisions, the research on the relationship between financial literacy and household financial decisions is relatively mature, as discussed above. Among the large amounts of empirical studies, of relevance for this chapter is the role

of financial literacy in determining household decisions on liquid assets (cash and savings), housing debt and non-housing debt. Due to the limitations of data, shown in Appendix 4.2, this chapter only has asset information regarding cash and deposits across all five waves, the waves 2010 to 2019 of the China Family Panel Studies (CFPS). Therefore, the variable of household total financial assets is unprocurable. Therefore, this chapter concentrates on the absolute holdings of liquid assets, housing debt and non-housing debt, and the relative holdings with respect to total household income, instead of allocation.

The holdings of liquid assets are an important financial behaviour that facilitates consumption smoothing over the life cycle and help households buffer themselves from economic shocks (Heckman and Hanna, 2015). There is a positive association between financial literacy and the probability of being a planner (Lusardi, 2008). Households, as non-planners, adopt short-sighted "hand-to-mouth" strategies, hardly taking retirement planning into consideration (Hurst, 2004). Regarding household savings, low financial literacy limits individuals' ability to save sufficient money for consumption smoothing after retirement (Lusardi, 2008). In contrast, households with higher financial literacy better understand their saving situations, thus knowing how much to save for economic security (Gale *et al.*, 2012) and vice versa (Turnham, 2010). Furthermore, more financially literate people are more likely to allocate their assets towards illiquid risky assets (e.g., van Rooij *et al.*, 2011). Both basic and advanced financial literacy can be used to predict stock market participation (Almenberg and Dreber, 2015; van Rooij *et al.*, 2011).

There is also a positive relationship between financial literacy and savings both in the holdings (i.e., the probability of having a bank account or having savings) and amounts (i.e., the amounts of savings households have) (Heckman and Hanna, 2015; Klapper *et al.*, 2013). In particular, in the study of Heckman and Hanna (2013), the positive relationship between financial literacy and saving rates is still valid after controlling some individual factors (e.g., life cycle variables, bequest motives and financial advice) and institutional factors (e.g., access to financial services and employer-contributed retirement plans). Therefore, promoting financial literacy is an effective approach to increase household savings

and raising the demand for financial services, especially for those in the lowest income position in emerging markets (Cole *et al.*, 2011).

Turning to the empirical studies for the developing countries, based on survey data from the 2016 Access to Finance survey of the Enhancing Financial Innovation & Access dataset with more than 22,000 observations in Nigeria, the increase in financial literacy scores, ranging from 0 to 10 based on the answers of ten financial literacy questions, is associated with the likelihood of using both formal (i.e., saving services from banks and financial institutions) and informal (from other sources, such as cooperative societies and groups that provide saving services) saving services (Adetunji and David-West, 2019). The positive relationship between financial literacy and the probability of having savings is also found in some developing Asian countries, e.g., Cambodia and Vietnam (Morgan and Trinh, 2019) and Laos (Morgan and Long, 2020).

Additionally, financial literacy appears to influence households' borrowing behaviours. People with high financial literacy are less likely to exhibit very costly borrowing practices in using credit cards (e.g. not fully paying credit cards, ever being charged on the credit card balance, only paying the minimum level, ever being punished due to late payment, and exceeding the credit limit) (Allgood and Walstad, 2013, 2016), and also less likely to take up mortgages with higher interests (Moore, 2003). Financial literacy regarding taking up and managing debt (also called debt literacy) is relatively low for older people, women, ethnic minorities, and those with lower income, incurring higher fees and costs with debt (Lusardi and Tufano, 2015).

Financial literacy negatively impacts people's participation in excessive borrowing (e.g. using credit card balances to pay credit cards and buying durable goods with consumer credit) and over-indebtedness (e.g. using credit when unnecessary) (Sevim *et al.*, 2012). Furthermore, households with low debt literacy have a higher percentage of high-cost credit products in their credit portfolios, thereby inducing higher annualised percentage rates weighted by the components of households' consumer credit portfolios (meaning higher costs) (Disney and Gathergood, 2013). In the study of Disney and

Gathergood, financially illiterate households even show difficulty in understanding different debt products.

Moreover, financial literacy impacts different household debt categories from different borrowing channels, which is positively related to formal household debt from banks and negatively associated with household debt from informal non-bank resources (Klapper *et al.*, 2013). Looking at household mortgage debt and household consumer debt separately, financial literacy is positively related to the probability of having mortgage debt but negatively related to the probability of having consumer debt (Brown and Graf, 2013).

This chapter uses many determinants of liquid assets decisions and debt decisions as control variables, as in Heckman and Hanna (2015). Heckman and Hanna control age and its square, marital status, ethnicity, educational attainments, children dependency, employment status, being indebted or not, and variables reflecting households' economic conditions to explore how non-economic factors (e.g., financial literacy) determine household savings behaviours. Heckman and Hanna find that household income plays an important role in determining household savings, especially for households in the lowest income position with no capabilities and incentives to save.

Age is an important life cycle variable, which is thought to be most closely related to household saving behaviour (Kim and Yuh, 2018). Households in the early life cycle stage are more likely to save after controlling income and other factors (Hayhoe *et al.*, 2012). Apart from age, disparities in household saving behaviour also appear in different ethnical groups (e.g. Lusardi and Mitchell, 2011b; Mauldin *et al.*, 2016). Household composition (e.g. the child dependence ratio) is another factor influencing household savings (Yuh and Hanna, 2010). For example, the young and old dependency ratios reflect a source of financial burdens because young and old household members generate consumption but do not contribute to production (Leff, 1969). At the household level, based on data from the China Household Finance Survey (CHFS), household saving varies with educational attainments, health conditions, the number of working household members, the number of dependent children and retired

people, and household economic conditions after controlling risk attitudes and other demographic factors (Lugauer *et al.*, 2019).

The low-education people are more likely to be financially illiterate (Lusardi, 2008). Empirical evidence also shows that the average financial literacy of women is lower than that of men (Lusardi and Mitchell, 2008; Almenberg and Dreber, 2015). Meanwhile, women have lower stock market participation rates than men (Almenberg and Dreber, 2015; van Rooij *et al.*, 2011). The gender gap in mutual fund investment and stock market participation is narrowed when advanced financial literacy is taken into account (Dwyer *et al.*, 2002; Almenberg and Dreber, 2015).[41]

[41] In Dwyer *et al.* (2002), the authors do not mention the term advanced financial literacy directly, but the authors construct an investment knowledge index ranging from zero to twelve, equalling the number of correct answers to questions related to financial markets and financial investment.

4.2.5 The endogeneity problem of financial literacy

Financial literacy is considered an endogenous variable given that financial literacy can be affected by financial experiences and behaviours, the learning-by-doing processes (van Rooij *et al.*, 2011). Apart from reverse causality, omitted variables (affecting both financial literacy and outcome variables) and measurement errors may lead to endogeneity problems (Li and Qian, 2020). Since the true level of individual financial literacy is unobservable, measurement errors are inevitable in empirical research (Jappelli and Padula, 2013). However, to remedy the endogeneity problem and the omitted variable biases, appropriate instruments (IVs) for financial literacy have been used in the literature. There are two criteria for selecting instrument variables for financial literacy: whether candidate instruments are "sufficiently" correlated with financial literacy, the first condition, and whether they are independent of the disturbance terms of the second-stage estimation for outcome variables, the second condition (Behrman *et al.*, 2010). If a variable predicts financial literacy well and does not directly impact outcome variables, it can be regarded as a good instrument of financial literacy.

Based on the first condition, Behrman *et al.* (2010) propose three broad types of candidate instrumental variables for financial literacy, including age-dependent instruments (e.g. respondents' age when a new national education program is launched, macroeconomic indicators when entering the labour market, and prevailing pension practices when settling in a permanent job position), household background variables (e.g. paternal or maternal educational attainments, family economic conditions when being a child, and whether the respondents were previously child workers under a certain age), and personality variables mainly reflecting respondents' genetic endowments and other stable personal characteristics (e.g. risk aversion and self-esteem). After determining the potential instruments, it is also necessary to identify the problematic instruments by examining whether these variables meet the second condition of not impacting the outcomes directly. The authors find that in the instrumental variable estimates with outcome variables being the dependent variables, family background and risk aversion significantly impact household financial decisions on wealth accumulation.

Specifically, different instrumental variables are used by different studies, subject to data availability. Education or education-related policies can be used as either an age-dependent instrument or a personality variable. As an age-dependent instrument, Lusardi and Mitchell (2009) use a variable related to a specific policy indicating whether the state the respondent lived in at the age of 17 implemented mandatory financial education as an instrumental variable for the advanced financial literacy variable.[42] Education variables can also be regarded as a proxy for personality. Jappelli and Padula (2013) indicate that literacy at an early life stage determines insofar current financial literacy, thus affecting financial behaviours. Therefore, they measure initial literacy by calculating the average math scores at school age to instrument financial literacy. Considering numeracy is an important component of financial literacy, Gathergood and Weber (2017) also use math scores in school to instrument current financial literacy levels. The rationale behind this is that mathematical skills, measured by math scores, are a precondition in acquiring financial knowledge and forming financial literacy, thus making math scores and financial literacy highly correlated.

Similar to the math scores at school as a proxy variable for the literacy endowment before entering the labour market, Gathergood and Disney (2011) use financial education during the full-time education instrumenting the pre-labour financial literacy endowment. Indeed past financial literacy is an option for instrumenting current financial literacy (Ricci and Caratelli, 2017). Niu and Zhou (2017) and Niu *et al.* (2020) construct a dummy variable indicating having taken any training courses related to economics and finance or not to address the endogeneity problem of financial literacy. The validity of using the educational backgrounds of the same respondent as the instrument is questioned by Fernandes *et al.* (2014) due to the reason that early literacy is related to some unobservable factors, such as innate intelligence and intertemporal preferences, which have partial effects on financial behaviour variables. They insist that an appropriate instrument for financial literacy has no partial effect on the outcome variables, which is named the exclusion restriction assumption.

[42] Lusardi and Mitchell (2009) only instrument the advanced financial literacy variables.

Variables reflecting household backgrounds are also potential instruments of financial literacy. To get consistent estimates and solve the endogeneity problem, Jappelli and Padula (2017) use a set of dummy variables regarding the educational backgrounds (i.e. a degree in economics) of respondents and their parents as the instrumental variables, because financial literacy and consumption growth are both endogenous variables in the life-cycle consumption model developed by them.[43] van Rooij *et al.* (2011) instrument advanced financial literacy using two variables, one of which is the self-assessed parents' financial literacy proxying family fixed effects.[44]

There are some instrumental variables that do not belong to any of the three potential categories of financial literacy instruments mentioned by Behrman *et al.* (2010). A remarkable innovation is an attempt to instrument household financial literacy relying on geographical features. For example, Klapper *et al.* (2013) instrument financial literacy using the quantity of newspapers being circulated in the corresponding regions and the number of universities in the regions. The rationale behind this comes from the assumption that people learn from the information they are exposed to, and then their financial literacy level is increased. Additionally, the proximity to universities nearby is also utilised to proxy financial knowledge at the household level (Christiansen *et al.*, 2008). There is no doubt that households have no control over these variables reflecting features in specific districts, such as the number of newspapers and universities in regions. In addition, inspired by Lachance's neighbourhood effect (Lachance, 2014), Kim and Lee (2017) use the share of neighbours who have college degrees in each community to proxy the neighbourhood education level as the instrument variable of financial literacy.

Similarly, there is a novel method to deal with the endogeneity problem of financial literacy, using the average financial literacy within predefined regions as the instrumental variable. Following this method, with the information of predefined regions in which households are located, instruments can be easily

[43] Parental or maternal education or financial literacy are popular instruments for financial literacy (e.g. Lusardi and Mitchell, 2011c; van Rooij, Lusardi and Alessie, 2011, 2012; Arrondel, Debbich and Savignac, 2015; Ricci and Caratelli, 2017; Grohmann, 2018; Yu, 2020).
[44] The other instrumental variable is the financial situation of the respondent's oldest sibling.

constructed by calculating the average financial literacy scores within each region. From the perspective of using survey data, the standout strength of this method is that there is no need to introduce additional exogenous variables satisfying the requirement of acting as instrumental variables of financial literacy, that is, having a strong relationship with financial literacy. The lack of appropriate instrumental variables is a main challenge of financial literacy studies in developing countries (Anantanasuwong, 2020).

Based on the CFPS 2014, from the same data source of this chapter, Li and Qian (2020) choose the average financial literacy of all families within each county to instrument the financial literacy variable measured by the scores of the Big Three questions with equal weight. The reason why the authors think it is an ideal instrument is that the local average financial literacy is closely related to the financial literacy of individual households, partially due to the finding of Bucher-Koenen and Lusardi (2011) that households' financial literacy can be improved by learning from others around them (the peer effect). At the same time, households' decision does not, in turn, affect the average financial literacy within each country. Similar methods have been used by Zheng *et al.* (2021) and Liu *et al.* (2021).

The unique feature of Liu *et al.* (2021) is that the target household is excluded when calculating the average financial literacy within a district. By doing this, the instrument variables better satisfy the exclusion requirement that the instrumental variables have no partial effects on the dependent variables. The exclusion requirement is the restriction that a proper instrument should meet after controlling the endogenous variable (Fernandes *et al.*, 2014). Inspired by these methods, this chapter uses the average basic and advanced financial literacy of the other households within each county, excluding the target households, as the instrumental variables of basic and advanced financial literacy.

4.3 Data and Variables

4.3.1 Data

This chapter uses the China Family Panel Studies (CFPS) by the Institute of Social Science Survey (ISSS) of Peking University, which is a nationally representative longitudinal survey in China. The survey is conducted in 25 administrative units excluding Hong Kong Special Administrative Region, Macao Special Administrative Region, Xinjiang Uygur Autonomous Region, Tibet Autonomous Region, Qinghai province, Inner Mongolia Autonomous Region, Ningxia Hui Autonomous Region, Taiwan province and Hainan province, covering the majority of the total population of Chinese mainland, around 95% (Xie and Lu, 2015).[45] The target population of the CFPS is all family members of households living in the twenty-five provinces (Xie and Hu, 2014). The CFPS adopts multistage probability proportional to size sampling (PPS) with the subsamples obtained through three stages: in the first stage, the primary sampling unit (PSU) is an urban administrative district or a rural county; in the second stage, the sampling unit is an urban community or a rural village; and in the third stage, the final sampling unit is the household (Xie and Hu, 2014; Xie and Lu, 2015). A large amount of information is collected biannually using computer-assisted person-to-person interviews. This chapter uses five waves of the CFPS (2010, 2012, 2014, 2016 and 2018) already published by the ISSS.[46]

The questionnaires of each wave contain five main sections regarding community/village basic information, basic information of household members (e.g. gender, age, marital status, highest education attainments, registration type, and so on), household economic conditions (e.g. household income, assets, expenditure and debt), adult household members (e.g. education history, education expenditure, employment, health, values, political attitudes, retirement and pensions, and social

[45] See Xie, Qiu and Lyu (2012) and Xie and Hu (2014)for the sampling design of the CFPS.
[46] The official website of the CFPS is http://www.isss.pku.edu.cn/cfps/en/. The questionnaires, user manuals, data and other relevant information can be found on this website.

relationships) and young household members, e.g. schooling, training, tutoring, academic performance, parental supervision and health (Xie *et al.*, 2017). The information used in this chapter mainly comes from the household member questionnaires for individual characteristics and the household economic condition questionnaires. It is worth noting that the questions relating to financial literacy and family economic conditions are answered by the household member who is most familiar with the actual household economic conditions. Following van Soest and Kapetyn (2006) and Li and Qian (2020), this chapter argues that the household representative respondent who is most familiar with the economic situations plays a dominant role in economic decisions within that family.

The survey modules included in the CFPS surveys can be divided into three types: recounted and retrospective modules (the baseline modules), constantly updated modules (the core modules), and supplementary modules (the optional modules). The baseline modules are designed for those facts that will not change much, including birth years, gender, the time of first marriage and so on. For these modules, the investigators collect relevant information from respondents once and check the accuracy and precision of recorded information in the following waves. For the core module, the information involved may vary over time, and it is necessary to gather and update new information. As for the last category, they only appear in some waves.

The financial literacy module belongs to the optional supplementary modules, only appearing in the 2014 wave and the recent 2018 wave. The financial literacy module of the CFPS 2014 contains both basic and advanced financial literacy questions, while the 2018 wave only contains three questions (interest compounding, inflation and risk diversification). The basic financial literacy questions mainly focus on the basic concepts and skills required in all financial decisions (i.e. interest rates, numeracy, interest compounding, inflation and the time value of money), while the advanced financial questions focus on the knowledge and skills related to risky financial decisions (e.g. risk-return trade-offs, the central bank, stocks, bonds and funds).

In the CFPS 2014, there are 3910 households answering both basic and advanced financial literacy questions involved in the financial literacy module. In the empirical analysis, this chapter uses the average financial literacy level of all other households apart from the respondent household within each country as instrumental variables. Considering the strategy of constructing financial literacy instruments, households whose counties only contain one observation (the participating household) are removed from the sample. After deleting these families and conducting data cleaning (e.g., dealing with the missing values of this module), 3539 among the total 3910 households have data for both basic and advanced financial literacy based on their answers to the questions contained in the financial literacy module. Based on data from the CFPS 2014, this chapter constructs basic and advanced financial literacy to investigate their roles in household economic decisions.

The financial literacy module containing both basic and advanced financial literacy questions is only included in the CFPS 2014. Following Bucciol and Zarri (2019) and Li (2021), this chapter makes an assumption that financial literacy of each household is constant over the five waves from 2010 to 2018 of the CFPS. After merging the five waves, 3510 of the 3539 households in the 2014 wave of the CFPS that have the measured basic and advanced financial literacy are successfully matched with data from the other four waves. Besides, 3491 households are recorded five times, appearing in all five waves, and 76 households are recorded four times. Finally, the pooled data have a total of 17531 observations, with 3507 observations for 2010, 3510 observations for 2012, 3509 observations for 2014, 3510 observations for 2016 and 3495 observations for 2018, respectively.

4.3.2 Dependent variables

This chapter uses three sets of dependent variables to explore the effects of basic and advanced financial literacy on household decisions regarding household liquid assets, household debt and household consumption. The choice of dependent variables is mainly restricted by the availability of data (Appendix 4.1). In detail, for the variables of household assets, only the information on cash and

deposits of households is collected for all five waves (the waves of 2010, 2012, 2014, 2016, and 2018).[47] As shown in Appendix 4.1, all waves collect information on households' housing and non-housing debt, and various expenditure categories of interest (here, food, clothing, housing, family equipment and daily necessities, medical and fitness, communication and transportation, and education and entertainment). All debt and consumption variables listed in Appendix 4.1 are included in the models. This chapter takes the logarithm of all outcome variables as the dependent variables.

The summary statistics of dependent variables are shown in Table 4.2. As shown in the third column of this table, the mean value of the log of the amount of cash and deposits is much larger than the log of housing and non-housing debt, indicating that the debt burden on Chinese households is, on average, not heavy. Looking at the standard deviation in the fourth column, the standard deviations of both debt variables are more than twice the average value of the log of housing debt and non-housing debt, showing high variation in households' debt levels. Compared with the standard deviations of the log of liquid assets and debt, the standard deviations of household expenditure components in the logarithm form are relatively smaller, 0.831 for the log of total consumptive expenditure and 1.026 for the log of food consumption. The fifth and sixth columns display the minimum and maximum values for each variable, indicating that the minimum value for all variables is zero. Figure 4.2 illustrates the distribution histograms of the dependent variables in their logarithmic form. Most households, at least greater than 99% of all households, have positive consumptive expenditure, food consumption, and communication and transportation consumption.

[47] In the recent two waves, except for savings and deposits, people are only asked whether they hold financial assets or not and, if yes, what the amount of household financial assets is. However, the information is still not complete for the first three waves. Considering this limitation, this chapter only uses the variable of cash and deposits for household assets.

Table 4.2 Summary statistics of the dependent variables

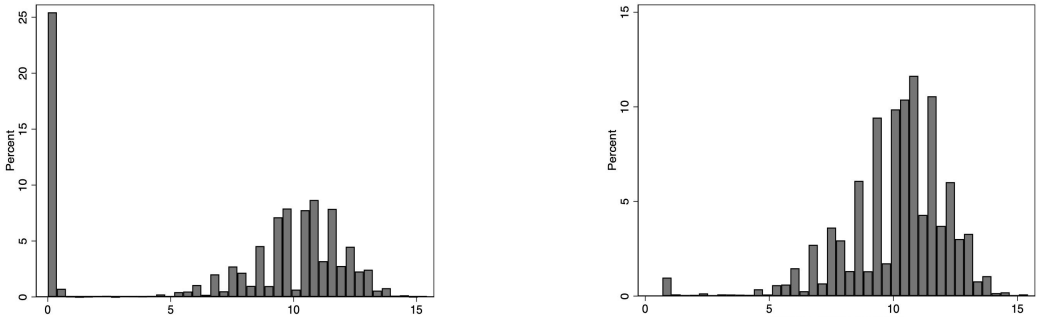
Variables	Obs	Mean	Std. Dev.	Min	Max
Panel A: dependent variables in the logarithmic form (removing the top 1% outliers)					
The log of the amount of cash and deposits	14,183	7.194	4.814	0	15.425
The log of housing debt	14,158	1.630	4.060	0	15.202
The log of non-housing debt	14,153	1.428	3.578	0	15.425
The log of expenditure on family equipment and daily necessities	13,910	7.565	1.817	0	14.737
The log of expenditure on clothing	13,998	6.923	2.228	0	12.429
The log of expenditure on education and entertainment	14,075	5.976	3.910	0	13.128
The log of expenditure on housing	13,927	7.753	2.055	0	13.311
The log of medical and fitness expenditure	14,105	6.806	2.848	0	12.899
The log of consumptive expenditure	13,320	10.657	0.831	0	13.989
The log of expenditure on food	14,050	9.668	1.026	0	13.305
The log of expenditure on communication and transportation	13,981	7.881	1.391	0	11.772
Panel B: dependent variables as ratios with respect to household income (removing the top 1% outliers)					
Cash and deposits/Total income	14,183	0.791	1.522	0	10.000
Housing debt/Total income	14,158	0.316	1.090	0	6.989
Non-housing debt/Total income	14,153	0.183	0.743	0	5.455
Expenditure on family equipment and daily necessities/Total income	13,910	0.130	0.317	0	2.315
Expenditure on clothing/Total income	13,998	0.054	0.080	0	0.575
Expenditure on education and entertainment/Total income	14,075	0.117	0.216	0	1.429
Expenditure on housing/Total income	13,927	0.146	0.308	0	2.232
Medical and fitness expenditure/Total income	14,105	0.144	0.386	0	3.000
Consumptive expenditure/Total incomes	13,320	1.290	1.891	0	14.565
Expenditure on food/Total income	14,050	0.511	0.762	0	6.000
Expenditure on communication and transportation/Total income	13,981	0.099	0.146	0	1.056

Note: The statistics are calculated based on observations whose independent variables do not have missing values.

Figure 4.2 Distribution histograms of the dependent variables in the logarithmic form

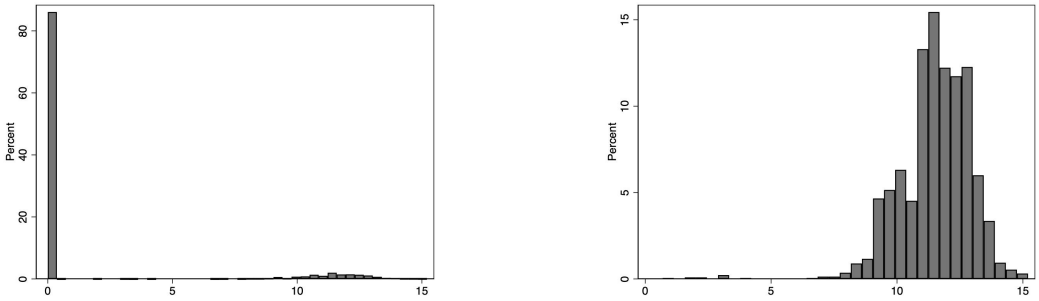
Cash and deposits

(Full sample) (Positive values)



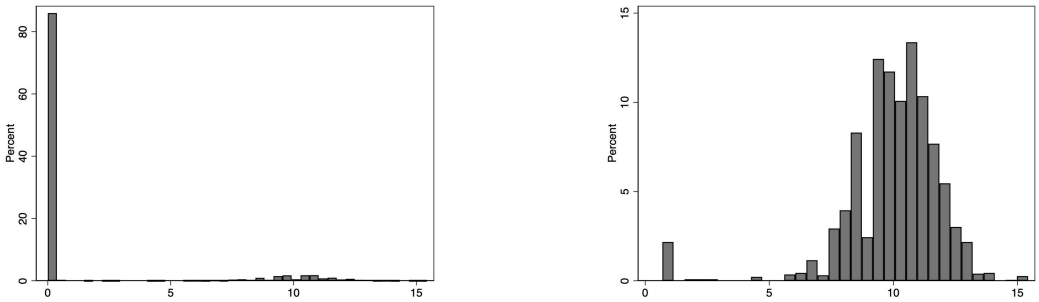
Housing debt

(Full sample) (Positive values)



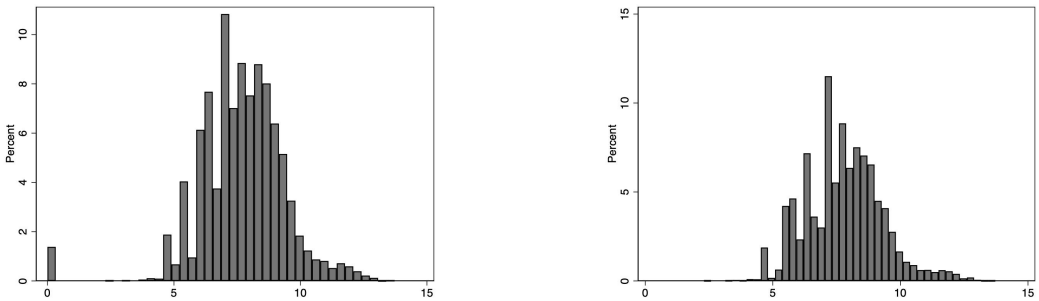
Non-housing debt

(Full sample) (Positive values)



Expenditure on family equipment and daily necessities

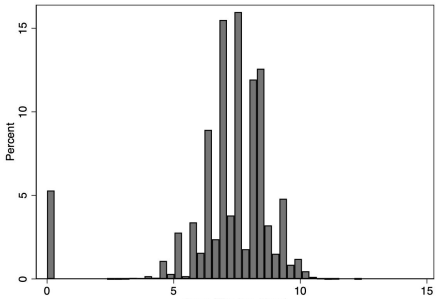
(Full sample) (Positive values)



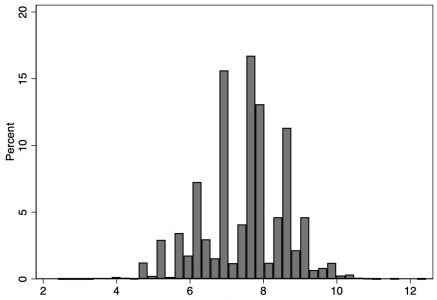
(continued)

Expenditure on clothing

(Full sample)

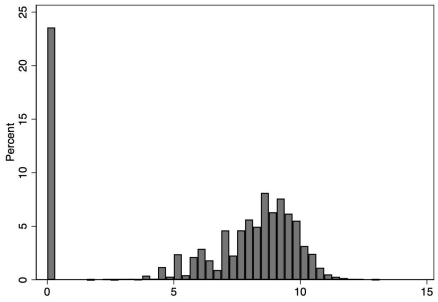


(Positive values)

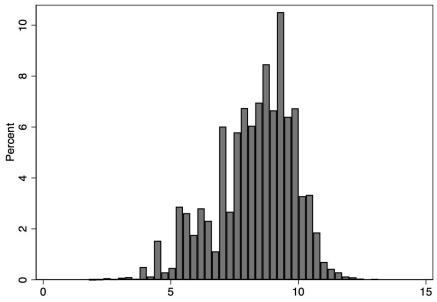


Expenditure on education and entertainment

(Full sample)

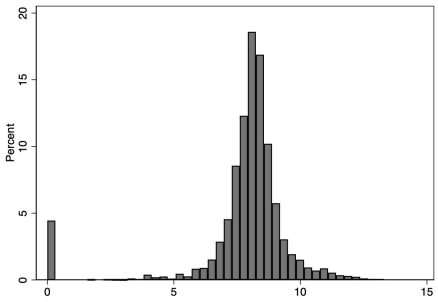


(Positive values)

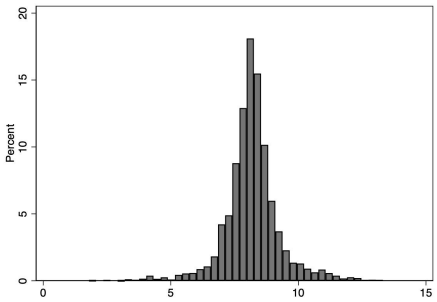


Expenditure on housing

(Full sample)

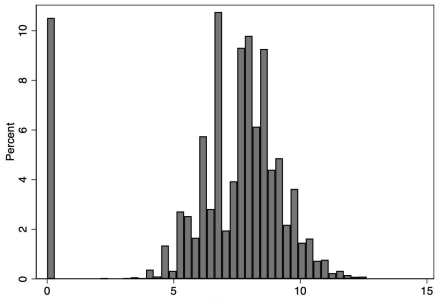


(Positive values)

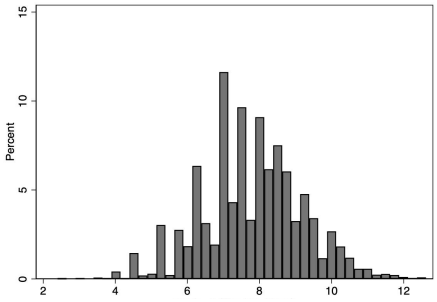


The log of medical and fitness expenditure

(Full sample)



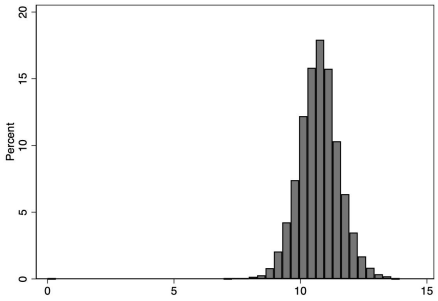
(Positive values)



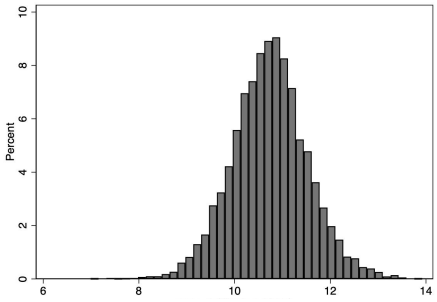
(continued)

Consumptive expenditure

(Full sample)

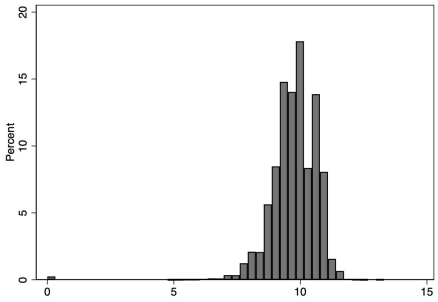


(Positive values)

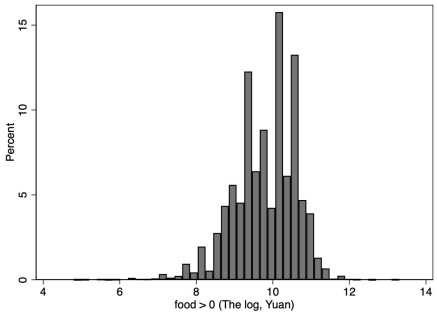


Expenditure on food

(Full sample)

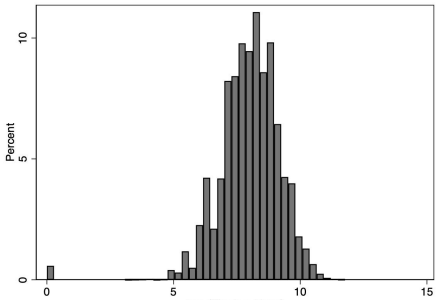


(Positive values)

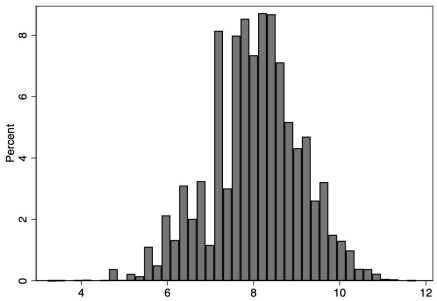


Expenditure on communication and transportation

(Full sample)



(Positive values)



4.3.3 Independent variables

The core explanatory variables are the basic financial literacy variable and the advanced financial literacy variable. Following the method of Li *et al.* (2020), thirteen financial literacy questions have been used to construct the financial literacy variables, with five simple and basic questions for the basic financial literacy indicator and eight for the advanced financial literacy indicator. The five basic financial literacy questions are regarding (1) the deposit interest rate for one-year fixed-term deposits, (2) numeracy (interest compounding for one year), (3) interest compounding for an additional year, (4) inflation rates, and (5) the time value of money respectively. Obviously, these questions are essential in daily life. At the same time, the eight advanced financial literacy questions are regarding (1) the relationship between return rates and risks, (2) the comparison of the risks of stocks and funds, (3) the central bank, (4) the comparison of the risks of different financial products, (5) the understanding of stocks, (6) the understanding of mutual funds, (7) the understanding of bank financial products, and (8) the core function of the stock market. The eight questions are more relevant to participation in financial markets and the knowledge of financial products.

Before constructing the final financial literacy variables, thirteen independent dummy variables are created for each financial literacy question, with 1 indicating that the respondent answers the question correctly and 0 indicating that the respondent does not answer the question correctly. The mean values of each dummy variable are shown in Table 4.3, with the basic financial literacy questions in Panel A and the advanced financial literacy questions in Panel B. From Panel A in Table 4.3, more than half of the respondents display good mastery of basic knowledge of interests, interest compounding, inflation and the time value of money, which are related to everyday financial activities. Even in the case of the numeracy question, 45% of respondents can provide the correct answer in this aspect.

In contrast, for the advanced financial literacy part, many respondents, around two-thirds and even higher, show their financial illiteracy in financial market literacy questions, except for one risk-return

trade-off question and one risk comparison question (Table 4.3). Specifically, 85% of respondents display financial knowledge of the risk-return trade-off, and 67% of respondents grasp that stocks have the highest risk level compared with other financial assets (i.e., savings, bonds and funds). More importantly, many respondents do not grasp the concepts related to the central bank and financial products such as stocks, funds, etc. To be specific, only 13% of respondents are correct in understanding capital funds, and 16% of respondents know the implication of holding stocks of a company. Similarly, around 30% are correct with questions regarding the central bank, the risks of stocks and bonds, bank financial products, and the core function of stock markets. Overall, the results show that financial literacy, especially financial market literacy (the advanced one), is not widespread in China.

Table 4.3 The mean values of thirteen financial literacy dummy variables

Financial literacy questions	Number of observations	Mean
Panel A: basic financial literacy questions		
(A1) Annual interest rate	3,901	0.54
(A2) Numeracy	3,901	0.45
(A3) Interest compounding	3,901	0.51
(A4) Inflation	3,901	0.58
(A5) Time value of Money	3,901	0.68
Panel B: advanced financial literacy questions		
(B1) Higher risks, higher returns (true/false)	3,901	0.85
(B2) Comparing the risks of stocks and funds (true/false)	3,901	0.35
(B3) The central bank of China	3,901	0.31
(B4) Comparing risks of different financial products	3,901	0.67
(B5) Implication of stock purchasing	3,901	0.16
(B6) Understanding capital funds	3,901	0.13
(B7) Understanding bank financial products	3,901	0.30
(B8) The core function of stock markets	3,901	0.28

The basic financial literacy variable is the sum of the five basic financial literacy dummies, and the advanced financial literacy variable is the sum of the eight advanced financial literacy dummies. Expressed in another way, basic financial literacy is measured as the number of basic financial literacy questions correctly answered by the respondent, and advanced financial literacy is the number of

sophisticated financial literacy questions correctly answered. Therefore, the basic financial literacy variable ranges from 0 to 5, and the advanced financial variable ranges from 0 to 8 based on the number of correct answers. For both variables, higher values represent higher financial literacy levels of each respondent. As in Morgan and Trinh (2019), for ease of comparison and interpretation, both indicators are standardised into z-score values by dividing the difference between the value and the mean of the financial literacy variables by the standard deviation of the variables. Details regarding the various explanatory variables can be found in Appendix 4.4.

This chapter introduces another variable reflecting respondents' personality: respondents' risk attitudes. Risk attitudes are important predictors of household financial behaviours (Hansen and Singleton, 1983). Chinese empirical evidence suggests that more risk-averse households are less likely to participate in financial markets and hold less risky assets (Jianjun Li *et al.*, 2020). In the 2014 CHPS survey, there is one question designed to collect respondents' risk attitudes: "*If your family decides to make investments, what kind of risks are you willing to take? (a) high risks, high returns; (b) moderate risks, steady returns; (c) low risks, low returns; (d) unwilling to take any risk.*" As shown in Appendix 4.3, the risk attitude variable has three values: 1 if households choose high or medium risks, 2 if low risks and 3 if no risk. Based on the risk attitude variable, two dummy variables of risk attitudes are included in the model, with households choosing no risk designed to be the reference group, one identifying the households choosing high or medium risks and the other identifying households choosing low risks.

Apart from the financial literacy variables and the risk attitude indicators, this chapter also controls household income and the family structure. Household income provides funds for making financial and consumption decisions (Jianjun Li *et al.*, 2020). This chapter constructs two different measurement methods of household income: the actual values of household income and the household income quintiles with higher-income households in higher quintiles (Appendix 4.4). The family structure is reflected in the use of three demographic variables (i.e., family sizes, the young dependency and the old dependency). The family size is the number of household members including the respondent. The young dependency ratio is defined as the ratio of the number of household members under sixteen years old

to the family size, while the old dependency ratio is defined as the ratio of the number of old household members aged 65 and over to the family size. The rationale behind selecting the dependency ratios is rooted in the fact that household members who are either young or elderly contribute to consumption but not to production (Leff, 1969).

Furthermore, following the existing literature, this chapter includes several variables of the demographic characteristics of the household economic respondent, such as age, gender, employment status, health status, Hukou status, marriage status, ethnic background and party membership (Appendix 4.4). The household economic respondent is the household member most familiar with household economic conditions and answers relevant questions for that household, including the financial literacy questions and the risk attitude question. Specifically, in the empirical specification, the controls include age in a quadratic form to account for the life cycle pattern effects, mainly consumption profiles. The dichotomous variable of the gender of household economic respondents is included to allow for average shifts between outcome variables for households with a male economic respondent versus households with a female economic respondent. Gender differences have been explored and identified in the existing literature, both for objective financial literacy and for financial behaviour. Statistically, the female cohort is more financially anxious and nervous about their financial decisions and financial situations than the male cohort, and then females are more likely to participate in sound financial behaviour (e.g. saving for long-term goals, retirement planning and spending within budgets) (Lind *et al.*, 2020).

Table 4.4 Descriptive Statistics of independent variables

Variables	Observations	Mean	Std. Dev.	Minimum	Maximum
Basic financial literacy	14,195	2.767	1.606	0	5
Advanced financial literacy	14,195	3.030	1.886	0	8
Standardised basic financial literacy	14,195	0.013	0.991	-1.695	1.391
Standardised advanced financial literacy	14,195	-0.005	0.990	-1.594	2.602
Average basic financial literacy within each county	14,195	2.717	0.649	0	5
Average advanced financial literacy within each county	14,195	2.996	0.752	0	8
Average standardised basic financial literacy within each county	14,195	-0.029	0.987	-4.164	3.444
Average standardised advanced financial literacy within each county	14,195	-0.030	0.980	-3.932	6.487
Risk attitude	14,195	3.084	0.945	1	4
The log of household income	14,195	10.797	1.066	1.386	16.030
Household income quintiles	14,195	3.004	1.414	1	5
Family size	14,195	3.302	1.558	1	26
Old dependency	14,195	0.177	0.307	0	1
Young dependency	14,195	0.125	0.160	0	1
House ownership	14,195	0.815	0.388	0	1
The characteristics of household economic respondent					
The age of household economic respondent	14,195	51.276	14.693	16	93
The squared age of household economic respondent divided by 100	14,195	28.452	15.504	2.560	86.490
Female respondent	14,195	0.484	0.500	0	1
With a degree	14,195	0.195	0.396	0	1
Attended school	14,195	0.679	0.467	0	1
Employment status	14,195	0.538	0.499	0	1
Health status	14,195	0.880	0.325	0	1
Hukou status	14,195	0.195	0.396	0	1
Marital status	14,195	0.824	0.381	0	1
Minority	14,195	0.042	0.200	0	1
Party membership	14,195	0.188	0.390	0	1

Note: When calculating the average values of all financial literacy variables, all other observations within the county in which the target household is located are included. For example, if a county has k observations, the average values are the mean of financial literacy scores of $k-1$ households, excluding the target household. The statistics are calculated based on observations whose independent variables do not have missing values.

The summary statistics of independent variables are shown in Table 4.4. Financial literacy variables measure the number of questions answered correctly. On average, Chinese households correctly answer 2.77 out of five basic financial literacy questions and 3.03 out of eight advanced financial literacy questions. Furthermore, the average scores of basic and advanced financial literacy within each county are 2.72 and 3.00, respectively. The categorical risk attitude variable has three values from 1 to 3, indicating different risk attitudes of different households. In the empirical analysis, the no-risk group is taken as the reference group when the risk attitude variable equals 3, and two dummies for the other two categories are generated to capture the distinction of financial and consumption behaviours among these three groups.

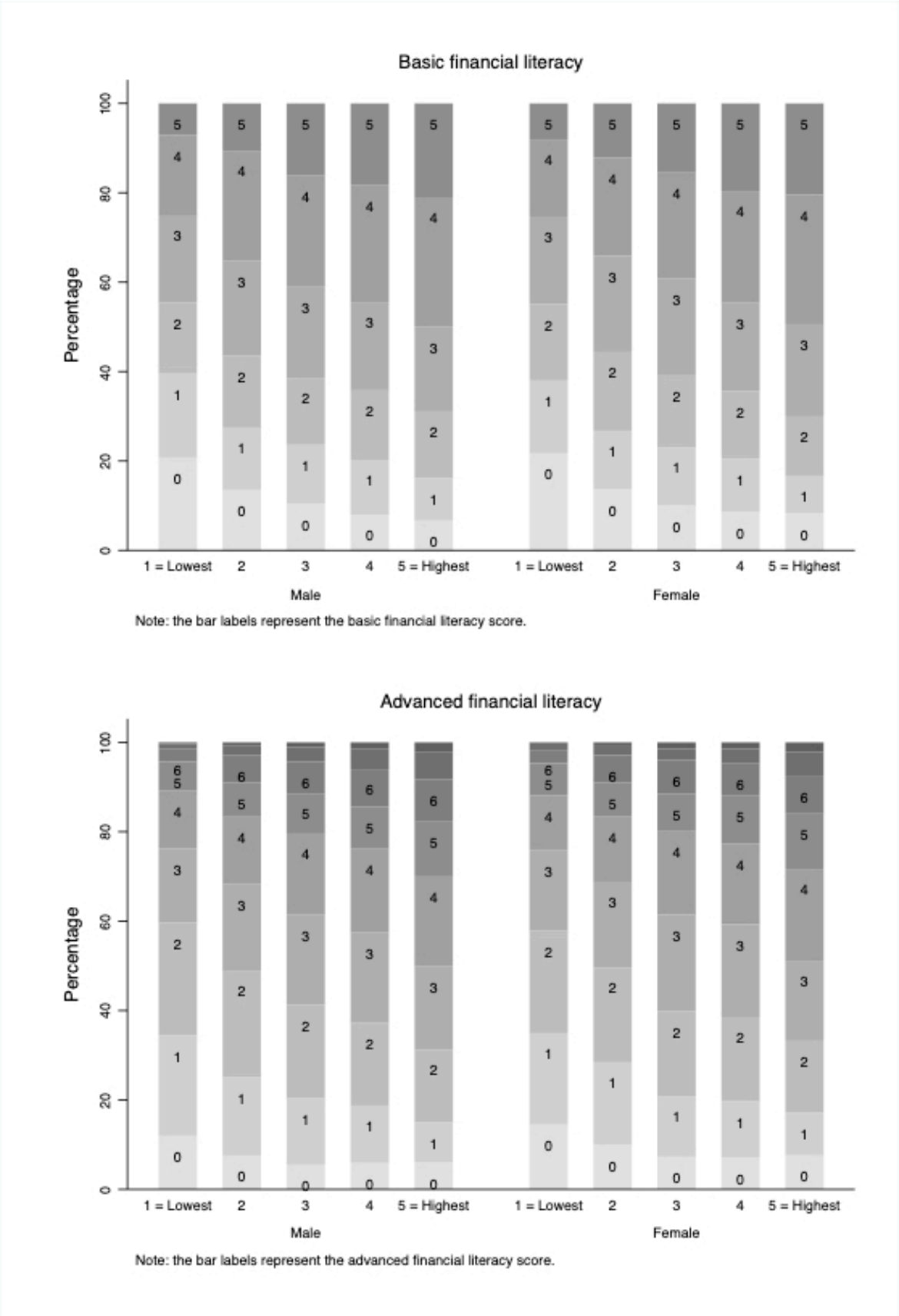
The summary statistics of the demographic variables of household economic respondents are also shown in Table 4.4. The respondents in the survey are aged over 16, and the oldest respondent is 93 years old. There are nine demographic dummy variables included in the following regressions. The mean values of these dummies in the third column in Table 4.4 indicate the average level of each variable. Specifically, 48.4% of household economic respondents are female; 53.8% of them are employed; 88.0% are in good health status; and 82.4% are married. With respect to the educational attainments of household economic respondents, 67.9% attended school, and 19.5% have at least one college degree. Turning to the two China-specific dummy variables (hukou status and party membership), 19.5% of household economic respondents have an agricultural hukou, and 18.8% of them are a member of the Chinese Communist Party.

Figure 4.3 shows the stacked bar charts comparing the distribution of basic and advanced financial literacy for households in different income quintiles and gender groups. All stacked bars have the same length. Each bar represents the percentage of households located in a specific income quintile with a specific basic financial literacy score. Looking at the stacked bar chart for basic financial literacy, the economic respondents of households in a higher income quintile perform better in answering the basic financial literacy questions. For example, from the length of the top bars representing the percentage of households correctly answering all basic financial literacy questions, the percentage of households with

a score of five increases when moving from a lower income position to a higher income position for both gender groups. Similar conclusions can be drawn when looking at the change in the percentage of households answering at least four out of five questions when moving to a higher income quintile, the fraction of households answering at least three questions, and so on.

In terms of advanced financial literacy, as shown in the second bar chart in Figure 4.3, the conclusion that households in a higher income quintile on average have better performance still holds. In addition, only a small fraction of households can correctly answer at least six out of eight advanced financial literacy questions, as shown in each stacked bar. From the summary statistics in Table 4.4, the average score of advanced financial literacy for all observations is approximately three. For households in the lowest quintile, more than 50% of households for both gender groups are below the average level of all households in the sample. As the families' income situation improves, moving to a higher income position, the percentage of below-average households in each stacked bar standing for the whole of households in different income ranges and with economic respondents of different gender obviously decreases accordingly.

Figure 4.3 Stacked bar charts for basic and advanced financial literacy across two categorical variables (household income quintiles and gender)



4.4 Empirical Analysis

4.4.1 Baseline methodology

To examine the relationship between financial literacy and household decision outcomes, this chapter uses both the random effects Tobit models and the Generalised Least Squares (GLS) models with random effects, which are suitable for unbalanced panel data. The reason for applying two different econometric methods is as follows. From the distribution diagrams shown in Figure 4.2, there are noticeable left spikes in the diagrams of the log of cash and liquids, the log of housing debt, the log of non-housing debt, the log of expenditure on family equipment and daily necessities, the log of expenditure on clothing, the log of expenditure on education and entertainment, the log of expenditure on housing, and the log of medical and fitness expenditure. The left spikes indicate that there is an obvious proportion of participant households not having any liquid financial assets (cash and deposits), any housing debt, any non-housing debt, and any consumption on family equipment and daily necessities, clothing, education and entertainment, housing, and health and fitness. All these eight limited dependent variables are censored at the lower zero.

To deal with the censored dependent variables, this chapter uses the Tobit censored regression technique with random effects to take both the censoring and continuous observations into consideration simultaneously assuming no additional formation mechanism of boundaries. From the estimated results of random effects Tobit models, two essential perspectives can be used to explain the relationship between financial literacy and the outcome of interest: the marginal effects at the extensive margins reflecting the likelihood of deviation from the lower zero limits (e.g. the likelihood of holding liquid financial assets), and the marginal effects at the intensive margins measuring the magnitude of the effect of financial literacy given the deviation from the censoring zero limits (e.g. the effect of financial literacy of the amount of household liquid financial assets conditional on households hold any liquid financial assets).

As for the three dependent variables regarding total consumptive expenditure, food consumption, and consumption on communication and transportation, there are no left or right spikes shown in Figure 4.2 and more than 99% of households have positive consumption on the three categories because the first percentile of the three variables is greater than zero shown in Table 4.2 above. Therefore, this chapter uses the random effects Generalised Least Squares (GLS) models to evaluate the determinants of them because they are treated as continuous variables.

The model specification of the baseline random effects Tobit model for the eight censored variables is as follows:

$$y_{it} = \max(0, y_{it}^{*}) \tag{4.1}$$

$$y_{it}^{*} = \beta_0 + \beta_1 \text{Basic}_{it} + \beta_2 \text{Advanced}_{it} + \lambda_1 \text{Risk}_{it}^{1} + \lambda_2 \text{Risk}_{it}^{2} + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it} \tag{4.2}$$

And the baseline GLS model specification for the three uncensored dependent variables is

$$y_{it} = \beta_0 + \beta_1 \text{Basic}_{it} + \beta_2 \text{Advanced}_{it} + \lambda_1 \text{Risk}_{it}^{1} + \lambda_2 \text{Risk}_{it}^{2} + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it} \tag{4.3}$$

where y_{it} indicates the outcome variable of household i at time t, and y_{it}^{*} is an unobserved latent variable. The equation above reflects a nonnegative constraint on y_{it}, and y_{it} takes the value of zero if the unobserved latent variable is less than or equal to zero and equals to y_{it}^{*} otherwise. There are four main dummy variables for financial literacy and risk attitudes. Basic_{ij} stands for the standardised basic financial literacy of households, representing the number of basic financial literacy questions answered correctly.

Similarly, Advanced_{it} represents the standardised advanced financial literacy, which is the number of advanced financial literacy questions answered correctly. Risk_{it}^{1} and Risk_{it}^{2} are two risk attitude dummy variables reflecting respondents' self-reported attitudes toward projects with different risks and different returns. Risk_{it}^{1} equals 1 if the respondent prefers projects with high/medium risks and high/medium returns when making investment decisions and 0 otherwise. Risk_{it}^{2} equals 1 if the respondent prefers projects with low risks and low returns when making investment decisions and 0 otherwise. The base category is the remaining households preferring no risk when making investment decisions. The covariate vector $\boldsymbol{X_{it}}$ is a set of control variables (see Appendix 4.4 for details). βs and λs are the coefficients, and $\boldsymbol{\gamma}$ is the coefficient vectors. μ_t is the year fixed effects. ε_{ij} is the error term.

In the equations above, the covariate vector $\boldsymbol{X_{ij}}$ includes either a variable of the log of household income or a set of dummy variables indicating household income quintiles (Appendix 4.4). Among the eleven dependent variables, household consumption variables represent flow indicators measured annually, meaning the total amount of household consumption of the past year or the past twelve months. However, the liquid financial asset variable and the debt variables refer to the stock of assets and debt for each household. Considering the heterogeneous features of the dependent variables, this chapter prefers using the household income quintile dummies to take the income effect into consideration. Nevertheless, the obvious disadvantage of including the income quintile dummies is the loss of information on the exact effect of household income on the log amount of assets, debt and consumption; that is, only the effect of moving from a lower-income quintile to a higher-income quintile is shown in the estimated results. Considering the focus of this chapter is the relationship between financial literacy and household consumption (more regressions for consumption), this chapter displays the results of the models with household income quintiles in the main sections, but also includes the results of the models with the log of household income in the appendices for the completeness.

4.4.2 Baseline estimation results

This section presents the baseline regression results without instrumental variables. The IV regression results with average basic and advanced financial literacy as the instrumental variables for the two endogenous variables, basic and advanced financial literacy, are shown in Section 4.4.4. For brevity, only results of interest in this chapter are shown in the empirical analysis section, while more detailed estimation results are placed in the Appendices section (from Appendix 4.6 to Appendix 4.33). Appendix 4.5 shows a table that briefly summarises the estimation tables shown from Appendix 4.6 to Appendix 4.33. The estimation results from Appendix 4.6 to Appendix 4.19 show the results of models with dependent variables in the logarithmic form, while the tables from Appendix 4.20 to Appendix 4.33 show the estimation results of models with dependent variables being ratios with respect to total household income.

The main estimated results of baseline models are reported in the following tables, Table 4.5 and Table 4.6. In both tables, there are three panels displaying the three sets of models containing only basic financial literacy (Panel A), only advanced financial literacy (Panel B), and both basic and advanced financial literacy (Panel C) in the models, respectively. For the results of each predictor, regression coefficients are shown first and then average marginal effects at the extensive and intensive margins followed for Tobit models. The interpretation of the estimated coefficients of Tobit regressions reported by Stata can be interpreted in a linear manner; that is, the linear relationship between predictors and the uncensored latent outcomes, instead of the observed dependent variables.[48] The marginal effects at the extensive margins is related to the effect of predictors on the probability of outcomes being uncensored, while the marginal effects at the intensive margins are related to the linear effect between predictors and observed outcomes conditional on outcomes' being uncensored.

[48] See https://stats.oarc.ucla.edu/stata/output/tobit-regression for details.

Table 4.5 The comparison of the results of financial literacy variables in baseline models for full sample when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients / Average marginal effects (AME) at the extensive margins and the intensive margins	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Panel A: Baseline models with basic financial literacy											
Basic financial literacy (coefficients)	0.791***	-0.974***	-1.986***	0.063***	0.187***	0.593***	0.055***	0.079**	0.058***	0.053***	0.095***
AME at the extensive margins	0.030***	-0.011**	-0.026***	0.000**	0.000***	0.027***	0.000*	0.001*			
AME at the intensive margins	0.548***	-0.148**	-0.327***	0.063***	0.186***	0.434***	0.055**	0.074*			
Panel B: Baseline models with advanced financial literacy											
Advanced financial literacy (coefficients)	0.553***	0.780**	-0.727**	0.085***	0.127***	0.622***	0.053**	0.048	0.068***	0.047***	0.121***
AME at the extensive margins	0.021***	0.009*	-0.010*	0.000***	0.000***	0.028***	0.000*	0.000			
AME at the intensive margins	0.383***	0.119*	-0.120*	0.085***	0.126***	0.456***	0.053*	0.045			
Panel C: Baseline models with basic and advanced financial literacy											
Basic financial literacy (coefficients)	0.693***	-1.525***	-2.067***	0.037*	0.166***	0.419***	0.042*	0.072*	0.038***	0.042***	0.057***
AME at the extensive margins	0.026***	-0.017***	-0.028***	0.000	0.000***	0.019***	0.000	0.001			
AME at the intensive margins	0.481***	-0.233***	-0.341***	0.037	0.165***	0.307***	0.042	0.068			
Advanced financial literacy (coefficients)	0.250***	1.409***	0.206	0.069***	0.053*	0.438***	0.035	0.016	0.052***	0.029**	0.096***
AME at the extensive margins	0.010**	0.016***	0.003	0.000**	0.000	0.020***	0.000	0.000			
AME at the intensive margins	0.174**	0.215***	0.034	0.069**	0.053	0.321***	0.034	0.015			

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Table 4.6 The comparison of the results of financial literacy variables in baseline models for full sample when the dependent variables are ratios with respect to total household income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients / Average marginal effects (AME) at the extensive margins and the intensive margins	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Panel A: Baseline models with basic financial literacy											
Basic financial literacy (coefficients)	0.243***	-0.150*	-0.375***	-0.005*	-0.001	0.017***	-0.016***	-0.019***	-0.131***	-0.062***	-0.007***
AME at the extensive margins	0.055***	-0.006	-0.026***	-0.006	-0.004	0.026***	-0.019***	-0.018***			
AME at the intensive margins	0.104***	-0.022	-0.059***	-0.002	0.000	0.007***	-0.008***	-0.008***			
Panel B: Baseline models with advanced financial literacy											
Advanced financial literacy (coefficients)	0.193***	0.263***	-0.138**	-0.003	-0.001	0.018***	-0.008**	-0.013***	-0.072***	-0.047***	-0.003*
AME at the extensive margins	0.044***	0.011**	-0.010*	-0.003	-0.004	0.028***	-0.010*	-0.013**			
AME at the intensive margins	0.082***	0.039**	-0.022*	-0.001	0.000	0.008***	-0.004*	-0.006**			
Panel C: Baseline models with basic and advanced financial literacy											
Basic financial literacy (coefficients)	0.202***	-0.305***	-0.392***	-0.005	-0.001	0.012***	-0.016***	-0.017***	-0.008	-0.005	0.001
AME at the extensive margins	0.046***	-0.013**	-0.027***	-0.006	-0.003	0.018**	-0.018***	-0.016***			
AME at the intensive margins	0.086***	-0.046**	-0.062***	-0.002	0.000	0.005**	-0.007***	-0.007***			
Advanced financial literacy (coefficients)	0.103***	0.391***	0.044	-0.001	-0.001	0.013***	-0.001	-0.005	0.040**	0.001	0.005***
AME at the extensive margins	0.023***	0.016***	0.003	-0.001	-0.002	0.021***	-0.001	-0.005			
AME at the intensive margins	0.044***	0.059***	0.007	0.000	0.000	0.006***	-0.001	-0.002			

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Table 4.5 presents the baseline results using the full sample when dependent variables are in the logarithmic form, with columns (1) – (8) showing the results using the random effects Tobit models and columns (9) – (11) showing the results applying the random effects GLS methods. Table 4.6 shows the results of baseline models using the full sample with ratios over total household income as the dependent variables in each model. Similarly, columns (1) to (8) of Table 4.6 contain the estimation results using random effects Tobit models, while columns (9) to (11) contain the results using random effects GLS approaches. In both tables, column (1) displays the results of the model of liquid assets (in the logarithmic form and in the ratio form respectively); columns (2) and (3) display the results of the housing debt and non-housing debt models; and columns (4) to (11) show the regression results of the consumption models.

Specifically, following the official instructions of Stata documents, the reported coefficients using both random effects Tobit models and random effects GLS models can be interpreted in a linear way, as mentioned above. That is, reported coefficients reflect the average changes of dependent variables in response to the changes of explanatory variables, *ceteris paribus*.[49] There are two types of dependent variables in this chapter, the logarithmic form and the ratio form. In particular, the coefficients for the models using the logarithmic form reveal the percentage changes of dependent variables in response to the changes of predictors, while the coefficients estimated from the models using the ratios to total household income can be interpreted in terms of a relative change with respect to total household income. Furthermore, the average marginal effects at the extensive margins obtained from random effects Tobit models indicate the changes in the probability of dependent variables of interest being positive, while the average marginal effects at the intensive margins indicate the changes of amounts conditional on positive holdings.

[49] Details can be found via these two links, https://www.stata.com/manuals/xtxttobit.pdf and https://www.stata.com/manuals/rtobit.pdf. Also see https://www.stata.com/manuals13/rtobitpostestimation.pdf for the description of Tobit-related post-estimation commands.

First, start with the analysis of the liquid asset models. In Table 4.5, column (1) shows the random effects Tobit estimates of the regression for the log of liquid financial assets (cash and deposits). In Panel A, from the results of the average marginal effects at the extensive margin, a one standard deviation increase of basic financial literacy scores is associated with a 3.0% increase in the likelihood of having positive amounts of cash and deposits, considering that the average marginal effect at the extensive margin is 0.030. Following this extensive marginal effect, the marginal effect at the intensive margin is 0.548, indicating that a one-unit standard deviation increase of basic financial literacy scores is related to a 54.8% increase of household liquid assets, conditional on being uncensored.

Looking at the average marginal effects in Panel B of Table 4.5, the marginal effect at the extensive margin is 0.021, suggesting that a one standard deviation increase of advanced financial literacy scores is associated with a 2.1% increase in the likelihood of having positive amounts of cash and deposits. The marginal effect at the intensive margin is 0.383, indicating that a one-unit standard deviation increase of advanced financial literacy scores is related to a 38.3% increase of household liquid assets, conditional on being uncensored.

In Panel C of Table 4.5, the estimated marginal effects at both extensive and intensive margins for both financial literacy variables are statistically significant at the 1% or 5% level. In particular, for basic financial literacy, the extensive marginal effect is 0.026, suggesting that a one standard deviation increase of basic financial literacy scores is associated with a 2.6% increase in the likelihood of cash and deposits being positive. The marginal effect at the intensive margin is 0.481, indicating that a one-unit standard deviation increase of basic financial literacy scores is related to a 48.1% increase of household liquid assets, conditional on having positive amounts of cash and deposits.

In Panel C of Table 4.5, for advanced financial literacy, the marginal effect at the extensive margin is 0.010, suggesting that a one standard deviation increase of advanced financial literacy scores is associated with a 1% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 0.174, indicating that a one-unit standard deviation increase of advanced

financial literacy scores is associated with a 17.4% increase of household liquid assets, conditional on having positive amounts of cash and deposits. In summary, both basic and advanced financial literacy have positive relationships with the probability of holding positive amounts of liquid assets and the amounts of liquid assets households hold conditional on being uncensored.

This finding is consistent with the findings of the existing literature that low basic financial literacy limits people's ability to save sufficient funds (Lusardi, 2008; Gale *et al.*, 2012; Heckman and Hanna, 2015). The estimated results add new evidence to the existing positive relationship between basic and advanced financial literacy and the holdings of liquid assets (Heckman and Hanna, 2015; Klapper *et al.*, 2013; Cole *et al.*, 2011; Morgan and Trinh, 2019; Morgan and Long, 2020; Kim and Yuh, 2018). Looking at the sign and magnitude of the coefficients for basic and advanced financial literacy, even though all coefficients are statistically significant and positive, the coefficients for basic financial literacy are larger than those for advanced financial literacy when basic and advanced financial literacy are involved in different models or a single model. The outcome implies that basic financial literacy makes a bigger impact on household holdings and amounts of cash and deposits.

Column (1) of Table 4.6 presents the estimation results of liquid asset models, but the dependent variables are the ratios of liquid assets with respect to total household income, reflecting relative holdings of cash and deposits over income. In column (1) of Panel A, the average marginal effect at the extensive margin is 0.055, suggesting that a one standard deviation increase of basic financial literacy scores is associated with a 5.5% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 0.104, indicating that a one-unit standard deviation increase of basic financial literacy scores is related to an increase of household liquid assets accounting for 10.4% of household income, conditional on being uncensored.

In Panel B of Table 4.6, the marginal effect at the extensive margin is 0.044, suggesting that a one standard deviation increase of advanced financial literacy scores is associated with a 4.4% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 0.082,

indicating that a one-unit standard deviation increase of advanced financial literacy scores is associated with an increase of the ratio of household liquid assets to income by 0.082, conditional on being uncensored. That is, the increase in the holdings of household liquid assets accounts for 8.2% of total household income.

In Panel C of Table 4.6, looking at the estimated results for basic financial literacy, the empirical results show that a one standard deviation increase of basic financial literacy scores is associated with a 4.6% increase in the likelihood of having positive cash and deposits with the extensive marginal effect being 0.046. Conditional on being uncensored, a one-unit standard deviation increase of basic financial literacy scores is related to an increase of household liquid assets accounting for 8.6% of total household income with the intensive marginal effect being 0.086. For advanced financial literacy, the marginal effect at the extensive margin is 0.023, suggesting that a one standard deviation increase of advanced financial literacy scores is associated with a 2.3% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 0.044, indicating that a one-unit standard deviation increase of advanced financial literacy scores is associated with an increase of household liquid assets accounting for 4.4% of total household income, conditional on having positive cash and deposits.

To conclude, both basic and advanced financial literacy have positive relationships with the probability of holding positive liquid assets and the amounts of liquid assets households hold measured as ratios to household income, conditional on being uncensored. This finding is in line with the existing evidence supporting the positive relationship between financial literacy and household savings (Heckman and Hanna, 2015; Klapper *et al.*, 2013; Cole *et al.*, 2011; Morgan and Trinh, 2019; Morgan and Long, 2020; Kim and Yuh, 2018), as mentioned above. Similar to the estimation results of models with liquid assets in the logarithmic form, the magnitude of the estimated coefficients and average marginal effects for basic financial literacy is larger than that for advanced financial literacy, providing further evidence that basic financial literacy plays a more important role in household holdings of liquid assets, even if there are positive relationships between both financial literacy indicators and household liquid assets.

Second, look at the estimation results for debt models, displayed in columns (2) and (3) of Table 4.5 and Table 4.6. Starting with the estimated results of housing debt models, in Panel A of Table 4.5, empirical results suggest that a one standard deviation increase of basic financial literacy is associated with a 1.1% decrease of the probability of being indebted to housing debt with an extensive marginal effect of -0.011. The average marginal effect at the intensive margin is equal to -0.148, indicating a negative relationship between basic financial literacy and the holdings of housing debt conditional on being indebted. That is, conditional on having positive housing debt, a one standard deviation of basic financial literacy is associated with a 14.8% decrease in housing debt.

In contrast, as shown in Panel B of Table 4.5, the sign of the coefficient and average marginal effects is different. The coefficient for advanced financial literacy is positive and statistically significant at 5% significance level. The significant positive average marginal effects at the extensive and intensive margins indicate that advanced financial literacy is positively related to the likelihood of being indebted to housing debt and the amounts of housing debt in the logarithmic form, conditional on being indebted. Specifically, a one-unit standard deviation increase of advanced financial literacy is associated with an increase of 0.9% in the probability of having positive housing debt and an increase of 0.119 in the logarithmic value of housing debt conditional on being indebted.

Furthermore, in Panel C of Table 4.5, all estimated coefficients of basic and advanced financial literacy are statistically significant at 1% significance level. The average marginal effect at the extensive margin for basic financial literacy is -0.017, implying that a one standard deviation increase of basic financial literacy is associated with a 1.7% decrease of the probability of being indebted to housing debt. In contrast, the average marginal effect at the extensive margin for advanced financial literacy is 0.016, implying that a one standard deviation increase of advanced financial literacy is associated with a 1.6% increase of the probability of being indebted to housing debt. This implies that basic and advanced financial literacy have opposite effects on the probability of having positive housing debt.

Turning to the intensive marginal effects, in Panel C of Table 4.5, the average marginal effects at the intensive margins are -0.233 for basic financial literacy and 0.215 for advanced financial literacy when both basic and advanced financial literacy variables are included in the models. This indicates that, conditional on having positive housing debt, basic and advanced financial literacy have opposite relationships with the amounts of housing debt. In detail, conditional on being indebted to housing debt, a one-unit standard deviation increase of basic financial literacy is associated with a 23.3% decrease of the amounts of housing debt in the logarithmic form. By contrary, conditional on having positive amounts of housing debt, a one-unit standard deviation increase of advanced financial literacy is associated with a 21.5% decrease of the amounts of housing debt in the logarithmic form.

The estimation results of the housing debt models in column (2) of Table 4.6 offer a new angle on the exploration of the relationship between financial literacy and household housing debt, changing the dependent variable of housing debt models from the absolute value measured in the logarithmic form to the relative value measured as ratios with respect to total household income. In Panel A, both the average effects at the extensive and intensive margins are insignificant, implying no significant relationship between basic financial literacy and the holding (i.e., the likelihood of being indebted) and amounts of housing debt. In Panel B, the extensive marginal effect of 0.011, statistically significant at 5% level, indicates that a one standard deviation increase of advanced financial literacy is positively related to an increase of 1.1% in the likelihood of being indebted to housing debt. The intensive marginal effect of 0.039 implies that a one standard deviation increase of advanced financial literacy is associated with a 0.039 increase of the housing debt ratio to household income. The increment is on average equivalent to 3.9% of total household income.

In Panel C of Table 4.6, all coefficients are statistically significant for the estimation results of housing debt models including both basic and advanced financial literacy. For basic financial literacy, from the average marginal effects, it is shown that an additional standard deviation score of basic financial literacy induces a 1.3% decrease in the likelihood of being indebted to housing debt after controlling for other factors, with the estimated average marginal effect at the extensive margin being -0.013

statistically significant at 5% significance level. The marginal effect at the intensive margin is -0.046, statistically significant at the 5% level, implying that an additional standard deviation score of basic financial literacy is associated with an 0.046 decrease in the housing debt ratios to income conditional on holding any housing debt. On average, given other factors unchanged, households with higher basic financial literacy hold a lower fraction of housing debt relative to their annual household income.

In contrast, looking at the Panel C of Table 4.6, the coefficients of advanced financial literacy and both average marginal effects are positive and statistically significant at 1% significance level. The extensive average margin of 0.016 implies that an additional standard deviation score of advanced financial literacy is positively related to a 1.6% increase in the likelihood of having positive housing debt. The intensive average margin of 0.059 indicates that, conditional on being indebted to housing debt, a one-unit standard deviation increase in advanced financial literacy scores is associated with an increase of 0.059 in the housing debt ratios with respect to income. That is, households with an additional standard deviation score in advanced financial literacy on average have a heavier housing debt burden accounting for 5.9% of total household income.

Additionally, for non-housing debt, there are also two sets of estimation results of non-housing debt models, among which one includes the estimation results for non-housing debt models with the logarithmic value of non-housing debt as dependent variables, and the other contains the estimation results with the non-housing debt ratios to household income as dependent variables. In column (3) of Table 4.5, the estimation results are for models with the dependent variables being the amounts of non-housing debt in the logarithmic form. In column (3) of Table 4.6, the corresponding models of non-housing debt use the ratios of non-housing debt with respect to total household income as the dependent variables.

In column (3) of Table 4.5, looking at the results of baseline models with basic financial literacy (Panel A), the estimated average marginal effect at the extensive margin is -0.026, meaning that an additional standard deviation score of basic financial literacy is related to a 2.6% decrease in the likelihood of

being indebted to non-housing debt after controlling for other factors. Besides, the estimated average marginal effect at the intensive margin is -0.327, implying that a one standard deviation increase in the basic financial literacy score is associated with a decrease of 32.7% in the amounts of non-housing debt held by households, given that households are non-housing borrowers.

After introducing advanced financial literacy into the non-housing debt models (the Panel C of Table 4.5), the sign of the coefficient and both average marginal effects for basic financial literacy keeps unchanged, and the magnitude of the coefficient and both average marginal effects is slightly larger than those in the models with only basic financial literacy. More specifically, the extensive marginal effect is -0.028, significant at 1% significance level, indicating that a one standard deviation increase of basic financial literacy is associated with a 2.8% decrease in the likelihood of being indebted to non-housing debt. The intensive marginal effect is -0.341, indicating that, conditional on being uncensored, a one standard deviation increase of basic financial literacy is related to the decrease in the amounts of household non-housing debt by 34.1%.

As for advanced financial literacy, the coefficient and the average marginal effects at both the extensive and the intensive margins lose significance from models with only advanced financial literacy to models with both basic and advanced financial literacy. As shown in Panel B of Table 4.5, an additional standard deviation score of advanced financial literacy is related to a 1% decrease in the likelihood of holding positive non-housing debt after controlling for other factors (the extensive margin being 0.010), and is associated with a 12% decrease of the non-housing debt in the logarithmic form, conditional on households holding any positive non-housing debt (the intensive margin). Comparatively, in Panel C, the results show that the change of advanced financial literacy does not influence the likelihood of holding non-housing debt (the extensive margin) and the amounts of non-housing debt conditional on holding positive non-housing debt (the intensive margin) due to the insignificance of both coefficients.

Turning to Table 4.6, column (3) of this table displays the estimation results of non-housing debt models when the dependent variables are the ratios of non-housing debt with respect to total household income.

In Panel A, the estimated extensive marginal effect for basic financial literacy is -0.026, implying that an additional standard deviation score of basic financial literacy is associated with a 2.6% decrease in the likelihood of having positive non-housing debt. The estimated average marginal effect at the intensive margin is -0.059, implying that a one standard deviation increase in the basic financial literacy score is associated with a decrease of 0.059 in the ratios of non-housing debt to income, given that households are non-housing borrowers.

After adding advanced financial literacy into the non-housing debt models (the Panel C of Table 4.6), the sign of the coefficient and both average marginal effects for basic financial literacy keeps unchanged, and the magnitude of the coefficient and both average marginal effects is slightly larger than those in the models with only basic financial literacy. This finding regarding basic financial literacy in the non-housing debt models is consistent with the results shown in Table 4.5 with the logarithmic value of non-housing debt as dependent variables. More specifically, the extensive marginal effect is -0.027, significant at 1% significance level, indicating that a one standard deviation increase of basic financial literacy is associated with a 2.7% decrease in the likelihood of being indebted to non-housing debt. The intensive marginal effect is -0.062, indicating that, conditional on being uncensored, a one standard deviation increase of basic financial literacy is related to the decrease in the amounts of household non-housing debt by 6.2% of total household income.

As for advanced financial literacy, the coefficient and the average marginal effects at both the extensive and the intensive margins are not significant when changing from models with only advanced financial literacy to models with both basic and advanced financial literacy. As shown in Panel B of Table 4.6, an additional standard deviation score of advanced financial literacy is related to a 1% decrease in the likelihood of holding positive non-housing debt after controlling for other factors (the extensive margin being 0.010), and leads to the decrease in household non-housing debt by 2.2% of total household income, conditional on households holding any positive non-housing debt (the intensive margin). In contrast, in Panel C, the results show that there is no relationship between advanced financial literacy and the likelihood of holding non-housing debt due to the insignificance of the extensive marginal effect.

The empirical results also suggest that there is no relationship between advanced financial literacy and the amounts of non-housing debt conditional on holding positive non-housing debt due to the insignificance of the intensive marginal effect.

In conclusion, the empirical results of the baseline housing debt models indicate there is a negative relationship between basic financial literacy and household housing debt and a positive relationship between advanced financial literacy and household housing debt, both in the probability of being indebted (the extensive margin) and the amounts in the logarithmic form or the ratio form over income conditional on being indebted (the intensive margin). From the empirical results of the baseline non-housing debt models, basic (advanced) financial literacy is negatively related to the likelihood of being indebted and the amounts in the logarithmic form or the ratio form over income conditional on being indebted to models with only basic (advanced) financial literacy. The inclusion of both basic and advanced financial literacy variables renders the coefficients and average marginal effects of advanced financial literacy variable insignificant, demonstrating that advanced financial literacy is not a contributing factor to household non-housing debt.

Third, look at the estimation results of consumption models. As mentioned earlier, there are two methods used to run the regressions of consumption models, the random effects Tobit approach and the random effects GLS approach. In both Table 4.5 and Table 4.6, the estimation results of consumption models are reported in columns from (4) to (11), with the results of random effects Tobit models shown in columns (4) to (8) and the results of random effects GLS models shown in columns (9) to (11). For random effects Tobit models, this chapter mainly focuses on the average marginal effects at the extensive and intensive margins.

Starting from the results in columns (4) to (8) in Table 4.5, all average marginal effects in Panel A are positive and statistically significant at different significance levels for the consumption models with only basic financial literacy regarding family equipment and daily necessities, clothing, education and entertainment, housing, and medical treatment and fitness. This indicates that a one standard deviation

increase of basic financial literacy is related to an increase in the likelihood of having positive consumption on these five categories, even if the extensive margins are relatively tiny except for the consumption on education and entertainment. According to the average marginal effects at the intensive margins, the results show that a one-unit standard deviation increase in the basic financial literacy scores is related to a 6.3% increase in the consumption on family equipment and daily necessities, an 18.6% increase in the consumption on clothing, a 43.4% increase in the consumption on education and entertainment, a 5.5% increase in housing consumption, and a 7.4% increase in the medical and fitness consumption.

In the panel B of Table 4.5, similar to the results shown in Panel A, the positive and significant average marginal effects at the extensive margins in columns (4) to (8) suggest that a one standard deviation increase of advanced financial literacy is related to an increase in the likelihood of having positive consumption on the five categories (equipment and daily necessities, clothing, education and entertainment, housing, and medical treatment and fitness). These extensive marginal effects are tiny except for the consumption model of education and entertainment, implying a positive but weak relationship. Based on the average marginal effects at the intensive margins, the results show that a one-unit standard deviation increase in the advanced financial literacy scores is related to a 8.5% increase in the consumption on family equipment and daily necessities, a 12.6% increase in the consumption on clothing, a 45.6% increase in the consumption on education and entertainment, a 5.3% increase in housing consumption, and a 4.5% increase in the medical and fitness consumption.

In Panel C of Table 4.5, for basic financial literacy, the extensive and intensive marginal effects for the consumption models on family equipment and daily necessities, housing, and medical treatment and fitness are not significant for models including basic and advanced financial literacy. The extensive marginal effects for the consumption models on clothing in column (5) and education and entertainment in column (6) suggest that a one standard deviation increase of basic financial literacy is related to an increase in the likelihood of having positive consumption on clothing, and education and entertainment. Conditional on having positive consumption, a one standard deviation increase of basic financial

literacy is related to a 16.5% increase of clothing consumption and a 30.7% increase of the consumption on education and entertainment.

Similarly, in columns (4) to (8) of Panel C, for advanced financial literacy, the extensive and intensive marginal effects for the consumption models on clothing, housing, and medical treatment and fitness are not significant for models including basic and advanced financial literacy. The extensive marginal effects for the consumption models on family equipment and daily necessities in column (4) and education and entertainment in column (6) suggest that a one standard deviation increase of advanced financial literacy is related to an increase in the likelihood of having positive consumption on family equipment and daily necessities, and education and entertainment. Conditional on having positive consumption, a one standard deviation increase of advanced financial literacy is related to a 6.9% increase of the consumption on family equipment and daily necessities and a 32.1% increase of the consumption on education and entertainment.

As for the random effects GLS models of consumption, the estimation results are shown in columns (9) to (11) of Table 4.5. In Panel A, the results show that one additional standard deviation score of basic financial literacy is associated with a 5.8% increase of total consumptive expenditure, a 5.3% increase of food consumption, and a 9.5% increase of the consumption on communication and transportation. In Panel B, the GLS estimated coefficients indicate that a one standard deviation increase of advanced financial literacy is related to a 6.8% increase of total consumptive expenditure, a 4.7% increase of food consumption, and a 12.1% increase of the consumption on communication and transportation.

In panel C, the positive correlation between financial literacy (both basic and advanced) and the three consumption categories is unchanged, but the magnitude decreases. From the estimation results of consumption models including basic and advanced financial literacy, a one standard deviation score of basic financial literacy is associated with a 3.8% increase of total consumptive expenditure, a 4.2% increase of food consumption, and a 5.7% increase of the consumption on communication and transportation. For advanced financial literacy, a one standard deviation increase of advanced financial

literacy is related to a 5.2% increase of total consumptive expenditure, a 2.9% increase of food consumption, and a 9.6% increase of the consumption on communication and transportation.

Turning to columns (4) to (11) in Table 4.6, the dependent variables of the consumption models are the consumption-to-income ratios for different consumption categories, standing for a relative household consumption with respect to household income. In columns (4) and (5), from the average marginal effects at both the extensive and the intensive margins that are insignificant, there is no significant correlation found between financial literacy (both basic and advanced) and household consumption on (i) family equipment and daily necessities and (ii) clothing, in the two dimensions, the probability of having positive consumption (the extensive margin) and the conditional amounts on having positive amounts (the intensive margin).

In column (6) of Table 4.6, for all three panels, the average marginal effects (extensive and intensive) are positive and statistically significant, indicating that there is a positive relationship between financial literacy (both basic and advanced) and the probability of having positive consumption on education and entertainment, and a positive correlation between financial literacy (basic and advanced) and the conditional amounts of household consumption on education and entertainment given that households have positive amounts in this consumption category. Combined with the analysis of the results recorded in column (6) of Table 4.5, a positive relationship exists between financial literacy (basic and advanced) and the consumption on education and entertainment in both forms (the absolute value in the logarithmic form and the relative value as ratios to income), in both dimensions, the probability of having positive consumption and the conditional amounts of consumption given being uncensored.

In columns (7) and (8) of Table 4.6, looking at the average marginal effects at the extensive margins of basic financial literacy in Panel A and Panel C, in both models, the empirical results show that a one standard deviation increase of the basic financial literacy scores is negatively associated with a decrease in the probability of having positive housing consumption (1.9% for the model with only basic financial literacy and 1.8% for the model with both financial literacy variables) and a decrease in the probability

of having positive medical and fitness expenditure (1.8% for the model with only basic financial literacy and 1.6% for the model with both financial literacy variables). From the average marginal effects at the intensive margins, basic financial literacy scores are negatively related to the conditional amounts of housing expenditure and medical and fitness expenditure given being uncensored. It is worth noting that the inclusion of advanced financial literacy in Panel C does not have much effect on the magnitude of the coefficients of basic financial literacy.

In columns (9) to (11) of Table 4.6, the estimated coefficients are reported for the consumption models with continuous consumption outcomes. In Panel A, a one standard deviation increase of basic financial literacy is associated with a decrease of total consumption accounting for 13.1% of total household income, a decrease of food consumption accounting for 6.2% of total household income, and a decrease of the consumption on communication and transportation accounting for 0.7% of total household income. In Panel B, a one standard deviation increase of advanced financial literacy is associated with a decrease of total consumption accounting for 7.2% of total household income, a decrease of food consumption accounting for 4.7% of total household income, and a decrease of the consumption on communication and transportation accounting for 0.3% of total household income. In Panel C, all basic financial literacy coefficients and the advanced financial literacy coefficient of food consumption lose significance, indicating no relationship between basic financial literacy and the three consumption categories (total consumption, food consumption, and consumption on communication and transportation). Besides, there are obvious changes in the sign and magnitude of the advanced financial literacy coefficients for the total consumption model and the food consumption model.

In conclusion, from the estimation results of baseline models using household consumption in the logarithmic form with only basic financial literacy, basic financial literacy is positively related to household consumption on family equipment and daily necessities, clothing, education and entertainment, housing, medical treatment and fitness, food, and communication and transportation, and total household consumption in the logarithmic form. From the estimation results of baseline models with only advanced financial literacy, advanced financial literacy is positively related to household

consumption on family equipment and daily necessities, clothing, education and entertainment, housing, food, and communication and transportation, and total household consumption. When basic and advanced financial literacy are both included in the models, basic financial literacy is positively related to household consumption on clothing, education and entertainment, food, and communication and transportation, and total household consumption in the logarithmic form.

From the estimation results of baseline models using household consumption as ratios to total household income with only basic (advanced) financial literacy, basic (advanced) financial literacy is positively related to household consumption on education and entertainment and negatively related to household consumption on housing, medical treatment and fitness, food, and communication and transportation, and total household consumption measured as the consumption-to-income ratios. When both basic and advanced financial literacy variables are included, the baseline results suggest basic financial literacy is positively related to household consumption on education and entertainment as ratios to income, but negatively related to household consumption on housing, and medical treatment and fitness. Advanced financial literacy is positively related to household consumption on education and entertainment, total consumption, and consumption on communication and transportation.

This chapter adopts the simplified life-cycle model proposed by Jappelli and Padula (2017) and Dinkova, Kalwij and Alessie (2021), which posits that financial literacy enters the model through interest rates, and the return rate is an increasing function of financial literacy. In other words, more literate households, on average, have higher returns from their portfolios (Dinkova *et al.*, 2021). This chapter has the estimation results of models including only basic financial literacy with the consumption amounts of different categories in the logarithmic form as the dependent variables, following Jappelli and Padula (2017) and Dinkova *et al.* (2021). The results are in line with the finding of Dinkova *et al.* (2021) that there is a positive association between objective financial literacy (basic financial literacy in this chapter) and household consumption levels (mainly nondurable consumption and food consumption).

This chapter also sheds light on the income effects based on the three sets of models using the absolute value of different consumption categories in the logarithmic form as the dependent variables. Households are divided into five income quintile groups based on total household income. There are four income dummies included in the models, representing the second quintile, the third quintile, the fourth quintile and the fifth (highest) quintile respectively, with households in the lowest quintile being the reference group. The analysis of the income effects is based on the sign and magnitude of the coefficients for the income quintile variables. As indicated from the coefficients in Table 4.7, except for the coefficients in column (3) for non-housing debt, all other coefficients reported in the table are positive. In column (1), all coefficients for the income dummies are statistically significant at 1% significance level. The relative size of these coefficients indicates that households hold more liquid assets when moving from a lower-income position to a higher-income position. This is consistent with the existing findings that high-income households save more than low-income households (see, e.g. Huggett and Ventura, 2000; Belke, Dreger *et al.*, 2015).

Looking at column (2) of Table 4.7, in Panel A, the coefficient of the income dummy in models with only basic financial literacy indicating households in the second income quintile is not significant, suggesting that there is no significant difference between the amounts of housing debt held by households in the lowest and second income quintiles. However, the coefficients of the top three income quintiles are positive and statistically significant. This indicates that households hold more housing debt when moving from the bottom two income quintile groups to any of the top three income quintile groups. Furthermore, among the top three income quintiles, households on average have higher amounts of housing debt when moving from a relatively lower income quintile to a relatively higher income quintile. The same pattern can be found from the coefficients in the estimation results of models with both basic and advanced financial literacy from Panel C. In Panel B, the results show that there is no difference in the holdings of liquid assets for households in the bottom three income quintiles, but households in the top two income quintiles have higher holdings of liquid assets.

Table 4.7 The comparison of the results of income quintiles in baseline models for full sample when the dependent variables are in the logarithmic form

Coefficients	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Panel A: Baseline models with basic financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.326***	0.961	-2.106***	0.326***	0.725***	0.575***	0.239***	0.092	0.214***	0.317***	0.298***
(2) Quintile 3 (40 - 60%)	2.182***	1.520*	-2.947***	0.590***	1.008***	1.108***	0.396***	0.341***	0.393***	0.481***	0.503***
(3) Quintile 4 (60 - 80%)	3.069***	4.104***	-3.783***	0.987***	1.271***	1.399***	0.590***	0.413***	0.568***	0.628***	0.724***
(4) Quintile 5 (80 - 100%) Highest	3.875***	7.561***	-1.827**	1.545***	1.551***	2.222***	0.852***	0.612***	0.866***	0.833***	1.032***
Panel B: Baseline models with advanced financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.382***	0.821	-2.268***	0.329***	0.737***	0.602***	0.243***	0.098	0.217***	0.320***	0.301***
(2) Quintile 3 (40 - 60%)	2.273***	1.272	-3.228***	0.593***	1.028***	1.144***	0.402***	0.352***	0.397***	0.486***	0.506***
(3) Quintile 4 (60 - 80%)	3.173***	3.754***	-4.147***	0.988***	1.294***	1.435***	0.596***	0.426***	0.571***	0.634***	0.726***
(4) Quintile 5 (80 - 100%) Highest	3.987***	7.064***	-2.282***	1.544***	1.577***	2.249***	0.858***	0.627***	0.868***	0.839***	1.033***
Panel C: Baseline models with basic and advanced financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.322***	0.952	-2.108***	0.325***	0.724***	0.572***	0.238***	0.092	0.214***	0.316***	0.298***
(2) Quintile 3 (40 - 60%)	2.170***	1.472*	-2.955***	0.586***	1.006***	1.092***	0.394***	0.340***	0.391***	0.479***	0.500***
(3) Quintile 4 (60 - 80%)	3.047***	3.991***	-3.799***	0.980***	1.267***	1.372***	0.586***	0.412***	0.565***	0.626***	0.719***
(4) Quintile 5 (80 - 100%) Highest	3.837***	7.370***	-1.856**	1.533***	1.544***	2.172***	0.846***	0.610***	0.861***	0.828***	1.024***

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardized.

Looking at column (3) of Table 4.7, the coefficients of income quintiles are all negative and statistically significant, indicating that households in the top four income quintiles on average have lower non-housing debt compared with households in the reference income group, no matter when the models include only basic financial literacy, only advanced financial literacy, or both basic and advanced financial literacy. From the comparison of the magnitude (the absolute value) of each income quintile coefficient, the magnitude of the coefficient for the fourth income quintile in all panels is the largest, indicating that compared with households in any of the other four income quintiles, households belonging to the fourth income quintile have a lower amount of non-housing debt.

Looking at columns (4) to (11) of Table 4.7, all reported coefficients are positive. Except for the coefficients of the income dummy indicating households in the second lowest income quintile in the model of medical and fitness consumption, all other coefficients of income quintiles for the consumption models are significant at the 1% significance level. Indicated by the magnitude of the coefficients, households on average have higher consumption levels (in the logarithmic form) when moving from a lower income quintile to a higher income quintile for nearly all consumption categories except the medical and fitness consumption, no matter when the models include only basic financial literacy, only advanced financial literacy, or both basic and advanced financial literacy. For medical and fitness consumption, the insignificance of the coefficient of the income dummy indicating households in the second income quintile suggests that there is no statistical difference between the amounts of medical and fitness consumption in the lowest and second lowest income quintiles.

4.4.3 IV methodology

Following Li and Qian (2020), to address the endogeneity problem due to reverse causality and omitted variables, this chapter uses the average financial literacy within each county, excluding the target household, as the instrument variable (IV) for financial literacy to perform two-stage regressions. The particularity of this chapter is that there are two endogenous financial literacy variables, the basic

financial literacy variable and the advanced financial literacy variable. Correspondingly, two different variables are required to instrument basic and advanced financial literacy respectively. To accommodate the new requirement, this chapter introduces two instruments responsible for their own endogenous variable. Specifically, the average basic financial literacy at the county level, excluding the basic financial literacy score of the respondents, is used to instrument the basic financial literacy, while the average advanced financial literacy within each county, excluding the score of the respondents, is used as the instrumental variable of advanced financial literacy.[50]

After determining the two instrumental variables for the two endogenous variables, this chapter processes estimation with two stages: in the first stage, run the regression of each endogenous variable on its instrument, risk attitude dummies and other covariates separately; in the second stage, run the regression of outcome variables on the estimated financial literacy variables in the first stage, risk attitude dummies and other covariates. In detail, the model specification with IVs is stated as follows. In the first stage, the equations for basic financial literacy and advanced financial literacy are:

$$\text{Basic}_{it}^{*} = \alpha_0 + \alpha_1 \overline{\text{Basic}}_{it} + \lambda_1 \text{Risk}_{it}^{1} + \lambda_2 \text{Risk}_{it}^{2} + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it} \tag{4.4}$$

$$\text{Advanced}_{it}^{*} = \alpha_0 + \alpha_2 \overline{\text{Advanced}}_{it} + \lambda_1 \text{Risk}_{it}^{1} + \lambda_2 \text{Risk}_{it}^{2} + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it} \tag{4.5}$$

where $\overline{\text{Basic}}_{it}$ and $\overline{\text{Advanced}}_{it}$ are the two instrumental variables, and Basic_{it}^{*} and Advanced_{it}^{*} are the two estimated financial literacy variables in the first stage, which are then used in the second-stage regression. αs are coefficients. In the second stage, the models are specified as follows. The IV Tobit model is

[50] It is worth noting that because we employ two endogenous instruments separately for each endogenous variable, standard Stata commands (e.g. `ivtobit` and `ivregress`) are not suitable, so this chapter uses the `cmp` command designed for mixed-process models with recursivity (clearly defined stages with sufficient information) and full observability for endogenous variables to be observed (Roodman, 2011).

$$y_{it} = \max(0, y_{it}^*)$$

(4.6)

$$y_{it}^* = \beta_0 + \beta_1 \text{Basic}_{it}^* + \beta_2 \text{Advanced}_{it}^* + \lambda_1 \text{Risk}_{it}^1 + \lambda_2 \text{Risk}_{it}^2 + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it}$$

(4.7)

The IV GLS model is

$$y_{it} = \beta_0 + \beta_1 \text{Basic}_{it}^* + \beta_2 \text{Advanced}_{it}^* + \lambda_1 \text{Risk}_{it}^1 + \lambda_2 \text{Risk}_{it}^2 + \boldsymbol{\gamma X_{it}} + \mu_t + \varepsilon_{it}$$

(4.8)

The endogeneity of financial literacy is truly and potentially a problem in the empirical studies of household financial and consumption behaviours, as discussed in Section 3.2.5. However, the severity of the endogeneity problem varies from study to study. The endogeneity problem of financial literacy is less serious in countries or districts with less developed financial markets or a lack of existing financial education programs (Klapper *et al.*, 2013). Even if the instruments are used in this chapter to address the endogeneity, the validity of these two instruments is still controversial.

4.4.4 IV estimation results

To address the potential endogeneity problem, this chapter uses the average basic financial literacy within each county and the average advanced financial literacy within each country to instrument the basic financial literacy variable and the advanced financial literacy variable separately, as discussed earlier. The first-stage estimation results are shown in the tables of Appendix 4.12 for models with dependent variables in the logarithmic form and the house ownership variable included, Appendix 4.13 for models with dependent variables in the logarithmic form and the house ownership variable excluded, Appendix 4.26 for models with dependent variables as ratios over income and the house ownership variable included, and Appendix 4.27 for models with dependent variables as ratios over income and the house ownership variable excluded. All estimated coefficients on the instruments (the average basic

financial literacy and the advanced financial literacy) are positive and statistically significant at 1% significance level, indicating positive and significant relationships between instruments (the average level at the county level) and endogenous variables (basic and advanced financial literacy).

The second-stage regression results using the full sample with the instrumented variables of basic and advanced financial literacy are reported in Table 4.8 and Table 4.9, with columns (1) to (8) showing the results of random effects IV Tobit models and columns (9) to (11) showing the results of the random effects IV GLS models in both models. In Table 4.8, the dependent variables are the absolute value of outcomes of interest in the logarithmic form, and in Table 4.9, the dependent variables are the relative value of outcomes with respect to total household income, which are ratios with respect to total household income. In this section, this chapter describes and analyses the estimation results first, and then criticises the findings and reflects the performance of the instrumental variables used in this chapter.

First, have a look at the estimation results of the liquid asset models with instrumental variables. In Table 4.8, column (1) displays the random effects IV Tobit estimates of the regression for the log of cash and deposits. In Panel A, the marginal effect at the extensive margin (0.070) indicates that a one standard deviation increase of basic financial literacy scores leads to a 7% increase in the likelihood of having positive amounts of cash and deposits, keeping other factors constant. The marginal effect at the intensive margin is 1.255, indicating that a one-unit standard deviation increase of basic financial literacy scores is related to a 125.5% increase of household liquid assets (cash and deposits), conditional on having positive cash and deposits. In Panel B, the marginal effect at the extensive margin is 0.095, suggesting that a one standard deviation increase of advanced financial literacy scores is associated with a 9.5% increase in the likelihood of having positive amounts of cash and deposits. The marginal effect at the intensive margin is 1.656, indicating that a one-unit standard deviation increase of advanced financial literacy scores is related to a 165.6% increase of household liquid assets, conditional on being uncensored.

Table 4.8 The comparison of the results of financial literacy variables in IV models for full sample when the dependent variables are in the logarithmic form

	IV Tobit								IV GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients / Average marginal effects (AME) at the extensive margins and the intensive margins	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Panel A: IV models with basic financial literacy											
Basic financial literacy (coefficients)	1.828***	0.829	-8.270***	0.529***	0.690***	1.400***	-0.210*	0.252	0.305***	0.352***	0.498***
AME at the extensive margins	0.070***	0.009	-0.116***	0.000***	0.001**	0.063***	0.000	0.002			
AME at the intensive margins	1.255***	0.127	-1.531***	0.529***	0.683***	1.015***	-0.210	0.236			
Panel B: IV models with advanced financial literacy											
Advanced financial literacy (coefficients)	2.452***	0.810	-7.485***	0.633***	0.661***	1.363***	0.054	0.339	0.394***	0.380***	1.018***
AME at the extensive margins	0.095***	0.009	-0.106***	0.000***	0.001**	0.062***	0.000	0.003			
AME at the intensive margins	1.656***	0.123	-1.366***	0.633***	0.656***	0.989***	0.054	0.317			
Panel C: IV models with basic and advanced financial literacy											
Basic financial literacy (coefficients)	0.683	0.352	-8.431***	0.302**	0.621***	1.094**	-0.541***	0.097	0.131*	0.259***	0.245*
AME at the extensive margins	0.026	0.004	-0.118***	0.000*	0.001*	0.049*	0.000	0.001			
AME at the intensive margins	0.465	0.054	-1.571**	0.302*	0.616**	0.784*	-0.540**	0.091			
Advanced financial literacy (coefficients)	1.846***	0.561	-0.171	0.380**	0.132	0.341	0.504**	0.255	0.282***	0.163*	0.410***
AME at the extensive margins	0.071**	0.006	-0.002	0.000*	0.000	0.015	0.000	0.003			
AME at the intensive margins	1.256**	0.086	-0.032	0.380*	0.131	0.245	0.503*	0.239			

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Table 4.9 The comparison of the results of financial literacy variables in IV models for full sample when the dependent variables are ratios with respect to total household income

	IV Tobit								IV GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients / Average marginal effects (AME) at the extensive margins and the intensive margins	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Panel A: IV models with basic financial literacy											
Basic financial literacy (coefficients)	0.653***	0.520	-1.469***	-0.009	-0.009**	0.003	-0.118***	-0.075***	-0.663***	-0.267***	-0.032***
AME at the extensive margins	0.139***	0.022	-0.112***	-0.010	-0.037*	0.005	-0.128***	-0.072**			
AME at the intensive margins	0.282***	0.079	-0.264***	-0.004	-0.005*	0.001	-0.056***	-0.033**			
Panel B: IV models with advanced financial literacy											
Advanced financial literacy (coefficients)	0.772***	0.628	-1.336***	-0.005	-0.013**	0.002	-0.097***	-0.060**	-0.620***	-0.281***	-0.028***
AME at the extensive margins	0.161***	0.027	-0.103***	-0.005	-0.051*	0.003	-0.108***	-0.058*			
AME at the intensive margins	0.332***	0.094	-0.236***	-0.002	-0.007*	0.001	-0.046***	-0.026*			
Panel C: IV models with basic and advanced financial literacy											
Basic financial literacy (coefficients)	0.404**	0.221	-1.563***	-0.013	-0.003	0.001	-0.136***	-0.087**	-0.652***	-0.217***	-0.036***
AME at the extensive margins	0.086*	0.009	-0.120***	-0.015	-0.013	0.002	-0.146***	-0.083*			
AME at the intensive margins	0.174*	0.033	-0.284***	-0.006	-0.002	0.000	-0.065***	-0.038*			
Advanced financial literacy (coefficients)	0.422*	0.451	0.051	0.007	-0.010	-0.000	0.021	0.015	-0.060	-0.094	0.003
AME at the extensive margins	0.089	0.019	0.004	0.008	-0.040	-0.001	0.023	0.015			
AME at the intensive margins	0.182	0.068	0.009	0.003	-0.005	0.000	0.010	0.007			

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

In Panel C of Table 4.8, the estimated coefficient and the average marginal effects (extensive and intensive) for basic financial literacy are not statistically significant, indicating that basic financial literacy does not have an impact on household holdings and amounts of liquid assets (cash and deposits). For advanced financial literacy, the coefficient is significant at 1% significance level, and the estimated marginal effects at both extensive and intensive margins are statistically significant at 5% level. In particular, for advanced financial literacy, the marginal effect at the extensive margin is 0.071, suggesting that a one standard deviation increase of advanced financial literacy scores leads to a 7.1% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 1.256, indicating that a one-unit standard deviation increase of advanced financial literacy scores is associated with a 125.6% increase of household liquid assets, conditional on having positive cash and deposits.

Turning to column (1) of Table 4.9, the dependent variables of the liquid asset models are the ratios of liquid assets (cash and deposits) with respect to total household income, reflecting relative holdings of cash and deposits over income. The coefficients and average marginal effects in Panel A and Panel B are statistically significant at 1% significance level. In Panel A, the average marginal effect at the extensive margin is 0.139, suggesting that a one standard deviation increase of basic financial literacy scores is associated with a 13.9% increase in the likelihood of having positive cash and deposits. The marginal effect at the intensive margin is 0.282, indicating that a one-unit standard deviation increase of basic financial literacy scores is related to an increase of household liquid assets accounting for 28.2% of total household income, conditional on having positive cash and deposits.

In Panel B of Table 4.9, the marginal effect at the extensive margin in the IV Tobit model of liquid assets with only advanced financial literacy is 0.161, suggesting that a one standard deviation increase of advanced financial literacy scores induces a 16.1% increase in the likelihood of having positive cash and deposits, *ceteris paribus*. The marginal effect at the intensive margin is 0.332, indicating that a one-unit standard deviation increase of advanced financial literacy scores is associated with an increase of household liquid financial assets accounting for 33.2% of total household income, conditional on being

uncensored. That is, the increase in the holdings of household liquid assets accounts for 7.9% of total household income.

In Panel C of Table 4.9, for basic financial literacy, the empirical results show that a one standard deviation increase of basic financial literacy scores leads to an 8.6% increase in the likelihood of having positive cash and deposits with the extensive marginal effect being 0.086, and conditional on being uncensored, a one-unit standard deviation increase of basic financial literacy scores induces an increase of household cash and deposits accounting for 17.4% of total household income with the intensive marginal effect being 0.174. However, for advanced financial literacy in the models with both basic and advanced financial literacy, the estimated average marginal effects at the extensive and intensive margins are not significant, indicating no causal relationship between advanced financial literacy and household liquid assets.

To conclude, in the models containing only basic financial literacy or only advanced financial literacy, a positive causal relationship is found between basic or advanced financial literacy and the probability of holding positive liquid assets, and between basic or advanced financial literacy and the amounts of household liquid assets measured as ratios to household income, conditional on having positive cash and deposits. The findings are consistent with the results of models where financial literacy is treated as exogenous, but there is a huge difference in the size of coefficients between liquid asset models with instruments and liquid asset models without instruments. Remarkably, in models with both financial literacy variables, the coefficients of basic financial literacy lose significance after employing instrumental variables to solve the potential endogeneity problem.

Second, look at the estimation results of housing and non-housing debt models. From columns (2) of Table 4.8 and Table 4.9, the coefficients and average marginal effects shown in these columns are not statistically significant, indicating that there is no causal relationship between financial literacy and household housing debt, in the probability of being indebted to housing debt and the amounts conditional on having positive housing debt. For non-housing debt, in column (3) of Table 4.8, the

estimation results are for models with the dependent variables being the amounts of non-housing debt in the logarithmic form. In column (3) of Table 4.9, the corresponding models of non-housing debt use the ratios of non-housing debt with respect to total household income as the dependent variables.

In column (3) of Table 4.8, the estimated average marginal effect at the extensive margin for IV Tobit models with only basic financial literacy is -0.116, meaning that an additional standard deviation score of basic financial literacy leads to an 11.6% decrease in the likelihood of having non-housing debt after controlling the endogeneity using instrumental variables. Besides, the corresponding estimated average marginal effect at the intensive margin is -1.531, implying that a one standard deviation increase in the basic financial literacy score is associated with a decrease of 153.1% in the amounts of non-housing debt held by households, given that households are non-housing borrowers.

After introducing advanced financial literacy into the non-housing debt models (the Panel C of Table 4.8), the sign of the coefficient and both average marginal effects for basic financial literacy keeps unchanged, and the magnitude of the coefficient and both average marginal effects is slightly larger than those in the models with only basic financial literacy. More specifically, the extensive marginal effect is -0.118, significant at 1% significance level, indicating that a one standard deviation increase of basic financial literacy induces an 11.8% decrease in the likelihood of being indebted to non-housing debt. The intensive marginal effect is -1.571, indicating that, conditional on being uncensored, a one standard deviation increase of basic financial literacy causes a 157.1% decrease of household non-housing debt.

Turning to advanced financial literacy, the coefficient and the average marginal effects at both the extensive and the intensive margins lose significance from models with only advanced financial literacy to models with both basic and advanced financial literacy. This is consistent with the findings of baseline non-housing debt models. As shown in Panel B of Table 4.8, an additional standard deviation score of advanced financial literacy is related to a 10.6% decrease in the likelihood of being indebted to non-housing debt after controlling from the average effect at the extensive margin being 0.106). Then,

a one standard deviation increase of advanced financial literacy scores is associated with a 136.6% decrease of the non-housing debt in the logarithmic form, conditional on households holding any positive non-housing debt (the intensive margin). Comparatively, in Panel C, the results show that the change of advanced financial literacy does not influence the likelihood of holding non-housing debt (the extensive margin) and the amounts of non-housing debt conditional on being indebted (the intensive margin) due to the insignificance of corresponding coefficients.

Turning to Table 4.9, column (3) displays the estimation results of non-housing debt models when the dependent variables are the debt-to-income ratios regarding household non-housing debt. In Panel A, the estimated extensive marginal effect for basic financial literacy is -0.112, implying that an additional standard deviation score of basic financial literacy is associated with an 11.2% decrease in the likelihood of being indebted to non-housing debt. The estimated average marginal effect at the intensive margin is -0.264, implying that a one standard deviation increase in the basic financial literacy score is associated with a decrease of 0.264 in the ratios of non-housing debt to income, given that households are non-housing borrowers.

After including both basic and advanced financial literacy variables into the non-housing debt models using a random effects IV Tobit methodology (the Panel C of Table 4.9), the sign of the coefficient and both average marginal effects for basic financial literacy are still negative, and the magnitude of the coefficient and both average marginal effects is relatively larger than those in the models with only basic financial literacy. More specifically, the extensive marginal effect is -0.120, significant at 1% significance level, indicating that a one standard deviation increase of basic financial literacy leads to a 12% decrease in the likelihood of being indebted to non-housing debt. The intensive marginal effect of basic financial literacy is -0.284, indicating that, conditional on being uncensored, a one standard deviation increase of basic financial literacy is related to the decrease in the amounts of household non-housing debt by 28.4% of total household income.

As for advanced financial literacy, the coefficient and the average marginal effects at both the extensive and the intensive margins lose significance from the IV Tobit models with only advanced financial literacy to the IV Tobit models with both basic and advanced financial literacy. In Panel B of Table 4.9, the extensive marginal effect at the extensive margin is 0.103, indicating that an additional standard deviation score of advanced financial literacy leads to a 10.3% decrease in the likelihood of holding positive non-housing debt. The marginal effect at the extensive margin is 0.236, suggesting that an additional standard deviation score of advanced financial literacy induces a decrease of the non-housing debt accounting for 23.6% of total household income, conditional on households holding any positive non-housing debt. In contrast, in Panel C, the results show that there is no relationship between advanced financial literacy and the likelihood of holding non-housing debt due to the insignificance of the extensive marginal effect. The empirical results also suggest that there is no relationship between advanced financial literacy and the amounts of non-housing debt conditional on holding positive non-housing debt due to the insignificance of the average marginal effect at the intensive margin.

In conclusion, after introducing the instruments to address the endogeneity problem, both basic and advanced financial literacy do not have impacts on household housing debt. In China, house purchases are mainly financed by individual savings and parental contributions, while mortgage loans are an alternative financing instrument for purchasing houses (Li, 2010). This is consistent with the data used in this chapter, with only approximately 14% of respondent households having housing debt. In China, financial agencies (e.g. commercial banks), as the originator of housing mortgage loans, are responsible for household housing debt (e.g. identifying and measuring risks) (LI, 2005). A possible explanation for the result is that the participation of professional institutions may weaken the role of basic and advanced financial literacy.

As for the non-housing debt models with instrumental variables, when only basic (advanced) financial literacy is included, households with higher basic (advanced) financial literacy scores have a lower probability of being indebted to non-housing debt and have higher amounts of non-housing debt conditional on being indebted. When both basic and advanced financial literacy are included in the non-

housing debt, basic financial literacy is negatively related to household non-housing debt but the results indicate advanced financial literacy has no impact on household non-housing debt.

Third, turn to the estimation results of the consumption models using a random effects IV Tobit methodology for five consumption categories (i.e., family equipment and daily necessities, clothing, education and entertainment, housing, and medical treatment and fitness) and a random effects IV GLS methodology for the other three consumption categories (i.e., total consumption, food consumption, and consumption on communication and transportation). In Table 4.8 and Table 4.9, the estimation results of consumption models are reported in columns (4) to (11), with the results of random effects Tobit models shown in columns (4) to (8) and the results of random effects GLS models shown in columns (9) to (11). For random effects Tobit models, this chapter mainly focuses on the average marginal effects at the extensive and intensive margins, which reveal the influence of financial literacy (basic and advanced) on the probability of having positive outcomes (the extensive margin) and the amounts of outcomes conditional having positive values.

Starting from the results in columns (4) to (8) in Table 4.8, all average marginal effects are positive. In Panel A, the extensive and intensive average marginal effects are statistically significant at 1% or 5% significance level for consumption on family equipment and daily necessities, clothing consumption and consumption on education and entertainment. In particular, the average marginal effects at the extensive margins indicate that a one standard deviation increase of basic financial literacy is related to an increase in the likelihood of having positive consumption on these three consumption categories, even if the extensive margin is relatively tiny for the consumption on family equipment and daily necessities. According to the average marginal effects at the intensive margins, the results show that a one-unit standard deviation increase in the basic financial literacy scores leads to a 52.9% increase in the consumption on family equipment and daily necessities, a 68.3% increase in the consumption on clothing, and a 101.5% increase in the consumption on education and entertainment, conditional on having positive consumption. However, due to the insignificance of the average marginal effects estimated for the models of clothing consumption in column (7) and medical and fitness consumption

in column (8), no causal effect is found between basic financial literacy and household consumption on these two categories.

In Panel B of Table 4.8, the positive and significant average marginal effects at the extensive margins in columns (4) to (6) suggest that a one standard deviation increase of advanced financial literacy is related to an increase in the likelihood of having positive consumption on the three categories (equipment and daily necessities, clothing, and education and entertainment). Based on the average marginal effects at the intensive margins, the results show that a one-unit standard deviation increase in the advanced financial literacy scores is related to a 63.3% increase in the consumption on family equipment and daily necessities, a 65.6% increase in the consumption on clothing, a 98.9% increase in the consumption on education and entertainment, conditional on having positive consumption. However, there is no causal relationship found between advanced financial literacy and housing consumption, and between advanced financial literacy and medical and fitness consumption.

In Panel C of Table 4.8, there are the estimation results for the random effects IV Tobit models with both basic and advanced financial literacy. In column (4), for both basic and advanced financial literacy, the average marginal effects at the extensive and intensive margins are tiny, positive and significant at 10% significance level. This indicates that both basic and advanced financial literacy have a very tiny positive effect on the probability of having positive consumption on family equipment and household daily necessities, and then having a positive impact on the consumption amounts conditional on being uncensored. In detail, a one-unit standard deviation increase of basic financial literacy induces a 30.2% increase of the consumption on family equipment and household daily necessities. A one-unit standard deviation of the advanced financial literacy scores leads to a 38% increase of the consumption on family equipment and household daily necessities.

In columns (5) and (6) of Panel C of Table 4.8, only the average marginal effects for basic financial literacy are statistically significant at 5% or 10% significance level. The insignificance of the average marginal effects for advanced financial literacy indicates that there is no causal relationship between

advanced financial literacy and household clothing expenditure, and between advanced financial literacy and consumption on education and entertainment. For advanced financial literacy, a one standard deviation increase of basic financial literacy leads to a 1% increase of the probability of having positive clothing consumption. Conditional on having positive clothing consumption, a one standard deviation increase of basic financial literacy is related to a 61.6% increase of household clothing consumption. Similarly, for advanced financial literacy, a standard deviation increase of basic financial literacy leads to a 4.9% increase of the probability of having positive consumption on education and entertainment conditional on being uncensored. A one-unit standard deviation increase of basic financial literacy leads to a 78.4%. Increase of household consumption on education and entertainment.

In column (7) of Panel C of Table 4.8, the average marginal effects at the extensive margins are not significant, indicating that both basic and advanced financial literacy have no effect on the probability of positive housing consumption. The average marginal effect at the intensive margin for basic financial literacy is -0.540, which is statistically significant at 5% significance level. This indicates that a one standard deviation increase of basic financial literacy leads to a 54% decrease of housing consumption conditional on positive housing consumption. The average marginal effect at the intensive margin for advanced financial literacy is 0.503, which is statistically significant at 10% significance level. This indicates that a one standard deviation increase of advanced financial literacy leads to a 50.3% increase of housing consumption conditional on positive housing consumption. In column (8) of Panel C of Table 4.8, all coefficients and average marginal effects are not significant, suggesting that no causal relationship is found between financial literacy (basic and advanced) and household medical and fitness expenditure.

As for the random effects IV GLS models of consumption, the estimation results are shown in columns (9) to (11) of Table 4.8. In Panel A, the results show that one additional standard deviation score of basic financial literacy is associated with a 30.5% increase of total consumptive expenditure, a 35.2% increase of food consumption, and a 49.8% increase of the consumption on communication and transportation. In Panel B, the IV GLS estimated coefficients indicate that a one standard deviation

increase of advanced financial literacy is related to a 39.4% increase of total consumptive expenditure, a 38% increase of food consumption, and a 101.8% increase of the consumption on communication and transportation.

In panel C, the positive correlation between financial literacy (both basic and advanced) and the three consumption categories is unchanged, but the magnitude decreases. From the estimation results of consumption models including basic and advanced financial literacy, a one standard deviation score of basic financial literacy leads to a 13.1% increase of total consumptive expenditure, a 25.9% increase of food consumption, and a 24.5% increase of the consumption on communication and transportation. For advanced financial literacy, a one standard deviation increase of advanced financial literacy leads to a 28.2% increase of total consumptive expenditure, a 16.3% increase of food consumption, and a 41% increase of the consumption on communication and transportation.

Turning to columns (4) to (11) in Table 4.9, the dependent variables of the consumption models are the consumption-to-income ratios for different consumption categories, standing for a relative household consumption with respect to household income. In columns (4) and (6), from the insignificant average marginal effects at both the extensive and the intensive margins in all panels, there is no significant correlation found between financial literacy (both basic and advanced) and household consumption on (i) family equipment and daily necessities and (ii) education and entertainment, in the two dimensions, the probability of having positive consumption (the extensive margin) and the conditional amounts as a proportion of total household income on having positive amounts (the intensive margin).

In column (5) of Table 4.9, in Panel A and Panel B, the average marginal effects (extensive and intensive) are positive and statistically significant at 10% significance level, indicating that there is a negative relationship between financial literacy (both basic and advanced) and the probability of having positive clothing consumption, and a negative correlation between financial literacy (basic and advanced) and the conditional amounts of household clothing consumption given that households have positive clothing consumption. In detail, a one standard deviation increase of basic financial literacy leads to a

decrease of clothing consumption by 5% in the model with only basic financial literacy. A one standard deviation increase of advanced financial literacy induces a decrease of clothing consumption by 7% in the model with only advanced financial literacy.

In columns (7) and (8) of Table 4.9, looking at the average marginal effects at the extensive margins of basic financial literacy in Panel A and Panel C, in both models, the empirical results show that a one standard deviation increase of the basic financial literacy scores is negatively associated with a decrease in the probability of having positive housing consumption (12.8% for the model with only basic financial literacy and 14.6% for the model with both financial literacy variables) and a decrease in the probability of having positive medical and fitness expenditure (7.2% in the model with only basic financial literacy and 8.3% in the model with both financial literacy variables).

From the average marginal effects at the intensive margins in Panel A and Panel C of Table 4.9, basic financial literacy scores are negatively related to the conditional amounts of housing expenditure (a decrease accounting for 5.6% of total household income in the model with only basic financial literacy and a decrease accounting for 6.5% of total household income in the model with both basic and advanced financial literacy) and medical and fitness expenditure given being uncensored (a decrease accounting for 3.3% of total household income in the model with only basic financial literacy and a decrease accounting for 3.8% of total household income in the model with both basic and advanced financial literacy).

In columns (9) to (11) of Table 4.9, the estimated coefficients are reported for the consumption models with continuous consumption outcomes. In Panel A, a one standard deviation increase of basic financial literacy is associated with a decrease of total consumption accounting for 66.3% of total household income, a decrease of food consumption accounting for 26.7% of total household income, and a decrease of the consumption on communication and transportation accounting for 3.2% of total household income. In Panel B, a one standard deviation increase of advanced financial literacy is associated with a decrease of total consumption accounting for 62% of total household income, a

decrease of food consumption accounting for 28.1% of total household income, and a decrease of the consumption on communication and transportation accounting for 2.8% of total household income.

In Panel C, the IV-GLS estimated coefficients of basic financial literacy in the models with both basic and advanced financial literacy are negative and statistically significant at 1% significance level, but the coefficients of advanced financial literacy lose coefficients in the models with both financial literacy variables. For basic financial literacy, a one standard deviation increase of basic financial literacy is associated with a decrease of total consumption accounting for 65.2% of total household income, a decrease of food consumption accounting for 21.7% of total household income, and a decrease of the consumption on communication and transportation accounting for 3.6% of total household income. However, for advanced financial literacy, there is no relationship between advanced financial literacy and the three consumption categories (total consumption, food consumption, and the consumption on communication and transportation).

In conclusion, after introducing instrumental variables into the models to solve the endogeneity problem, the empirical results suggest that there is a positive causal relationship between basic financial literacy and household consumption in the logarithmic form regarding family equipment and daily necessities, clothing, education and entertainment, food, communication and transportation, and total consumption. Comparatively, advanced financial literacy has a positive impact on household consumption on family equipment and daily necessities, food consumption, consumption on communication and transportation, and total consumption. This chapter is one of the first to introduce both basic and advanced financial literacy into household consumption. There is not much existing evidence to compare with. However, Dinkova *et al.* (2021) posit a positive relationship between (basic) financial literacy and nondurable consumption (e.g. food consumption), which is in line with the finding of this chapter with and without instrumental variables.

As in Anantanasuwong (2020), even if the endogeneity and reverse causality problems are raised, the author still leaves them unsolved due to the failure to find suitable instruments to address this problem

in models with only basic financial literacy or models with both basic and advanced financial literacy. Therefore, only correlations rather than causal relationships are found in this doctorate thesis. Nguyen and Nguyen (2020) use financial education indicators of respondents and the education level of the parents of respondents to instrument basic and advanced financial literacy in the empirical analysis of Vietnam. However, Nguyen and Nguyen do not provide details regarding the rationales and manipulations of the instrumental variables, and they do not clearly explain why the coefficients of basic financial literacy change from a positive number to a larger negative number after introducing the instrumental variables into the probit models.

Table 4.10 The comparison of the results of income quintiles in IV models for full sample when the dependent variables are in the logarithmic form

	IV Tobit								IV GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Panel A: IV models with basic financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.170***	0.697	-1.181*	0.256***	0.651***	0.457***	0.279***	0.066	0.178***	0.272***	0.241***
(2) Quintile 3 (40 - 60%)	1.893***	1.032	-1.215	0.459***	0.871***	0.888***	0.472***	0.293***	0.326***	0.397***	0.396***
(3) Quintile 4 (60 - 80%)	2.704***	3.489***	-1.590*	0.822***	1.097***	1.122***	0.686***	0.352***	0.483***	0.523***	0.588***
(4) Quintile 5 (80 - 100%) Highest	3.423***	6.800***	0.859	1.340***	1.338***	1.881***	0.972***	0.536***	0.762***	0.702***	0.866***
Panel B: IV models with advanced financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.248***	0.819	-1.818***	0.290***	0.700***	0.551***	0.243***	0.078	0.195***	0.297***	0.287***
(2) Quintile 3 (40 - 60%)	1.970***	1.267	-2.175***	0.504***	0.945***	1.030***	0.402***	0.305***	0.346***	0.433***	0.427***
(3) Quintile 4 (60 - 80%)	2.721***	3.747***	-2.569***	0.857***	1.169***	1.264***	0.596***	0.357***	0.496***	0.555***	0.580***
(4) Quintile 5 (80 - 100%) Highest	3.325***	7.053***	0.024	1.351***	1.394***	1.997***	0.858***	0.525***	0.758***	0.722***	0.823***
Panel C: IV models with basic and advanced financial literacy											
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.209***	0.733	-1.145*	0.263***	0.652***	0.615***	0.293***	0.071	0.185***	0.275***	0.250***
(2) Quintile 3 (40 - 60%)	1.916***	1.093	-1.139	0.461***	0.869***	1.127***	0.483***	0.295***	0.330***	0.397***	0.403***
(3) Quintile 4 (60 - 80%)	2.669***	3.545***	-1.486*	0.811***	1.091***	1.383***	0.682***	0.346***	0.479***	0.518***	0.584***
(4) Quintile 5 (80 - 100%) Highest	3.283***	6.864***	1.001	1.307***	1.323***	2.173***	0.940***	0.515***	0.743***	0.687***	0.841***

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardized.

Turn to the income effects based on the three sets of models shown in the three panels in Table 4.10 using the value of different consumption categories in the logarithmic form as the dependent variables. Households are divided into five income quintile groups based on total household income. There are four income dummies included in the models, representing the second quintile, the third quintile, the fourth quintile and the fifth (highest) quintile respectively, with households in the lowest quintile being the reference group. The analysis of the income effects is based on the sign and magnitude of the coefficients for the income quintile variables, as indicated by the coefficients in Table 4.10. In column (1), all coefficients for the income dummies are statistically significant at 1% significance level. The relative size of these coefficients indicates that households hold more liquid assets when moving from a lower income quintile to a relatively higher income quintile.

Looking at column (2) of Table 4.10, in Panel A, the coefficients of the income dummies indicating the second and third income quintiles are not statistically significant, indicating that there is no difference between the amounts of housing debt held by households in the bottom three income quintiles. However, the coefficients of the top two income quintiles are positive and statistically significant. In particular, the coefficients for the highest income quintile are greater than the coefficients for the second highest income quintile in all three sets of models (with only basic financial literacy, with only advanced financial literacy, and with both basic and advanced financial literacy). This indicates that households hold more liquid assets when moving from the bottom three income quintile groups to any of the top two income quintile groups. Furthermore, households on average have higher amounts of liquid assets when moving from the bottom three income quintiles to any of the top two income quintiles, or from the fourth income quintile to the fifth income quintile.

Looking at column (3) of Table 4.10, the coefficients of the second and fourth income quintiles are negative and statistically significant at 1% or 10% significance levels, indicating that households in the second and fourth income quintiles on average have lower non-housing debt compared with households in the reference income group and households in the highest income quintile, no matter when the models include only basic financial literacy, only advanced financial literacy, or both basic and advanced

financial literacy. However, the coefficient for the third income quintile is only significant in the non-housing debt model with only advanced financial literacy.

Looking at columns (4) to (11) of Table 4.10, all reported coefficients are positive. Except for the coefficients of the income dummy indicating households in the second lowest income quintile in the model of the medical and fitness consumption, all other coefficients of income quintiles for the consumption models are significant at the 1% significance level. Indicated by the magnitude of the coefficients, households on average have higher consumption levels (in the logarithmic form) when moving from a lower income quintile to a higher income quintile for nearly all consumption categories except the medical and fitness consumption, no matter when the models include only basic financial literacy, only advanced financial literacy, or both basic and advanced financial literacy. For medical and fitness consumption, the insignificance of the coefficient of the income dummy indicating households in the second income quintile suggests that there is no statistical difference between the amounts of the medical and fitness consumption in the lowest and second lowest income quintiles. These findings are unchanged compared with the income effects derived from the estimation results of models without instrumental variables, as shown in Table 4.7.

4.5 Conclusion and Discussion

This chapter is inspired by the theoretical models proposed by Jappelli and Padula (2017) and Dinkova *et al.* (2021), which are among the first to link financial literacy and household consumption (or consumption growth) directly. Both models posit financial literacy enters the life cycle consumption models through interest rates by assuming that return rates are an increasing function with respect to (basic) financial literacy. This assumption means financially literate households are expected to have higher return rates on their household portfolios. Jappelli and Padula (2017) provide empirical evidence for a positive relationship between consumption growth and financial literacy. Dinkova *et al.* (2021) provide empirical evidence supporting a positive relationship between financial literacy and nondurable household consumption, especially food consumption. The positive relationship between basic financial literacy and food consumption is also valid.

Based on these two empirical studies, this chapter explores the relationship between financial literacy (basic and advanced) and household financial and consumption decisions. First, this chapter considers not only household consumption variables but also household asset and debt variables. The use of asset and debt variables makes it possible to link this chapter to the existing mature research about the correlation between financial literacy and household financial decisions, even if only three financial outcome variables (liquid assets, housing debt, and non-housing debt) can be constructed from the datasets used by this chapter.

Second, this chapter is one of the first that attempts to introduce advanced financial literacy into household financial and consumption models. Following the opinions of the two main studies listed above, financial literacy enters the models through higher return rates of household financial portfolios. From the existing empirical evidence in China, both basic and advanced financial literacy have a positive impact on the returns of household financial portfolios in China (see, e.g., Chu *et al.*, 2017). In

the light of Lusardi and Mitchell (2009) and van Rooij *et al.* (2011), who endogenize both basic and advanced financial literacy, this chapter simultaneously includes basic financial literacy and advanced financial literacy regarding financial markets to explore the role of both basic and advanced financial literacy.

To make this chapter more comparable and more reliable, this chapter uses three sets of models: models with only basic financial literacy, models with only advanced financial literacy, and models with both basic and advanced financial literacy. The results of models with basic financial literacy can provide new evidence for one of the developing countries, easily to be integrated with the existing literature. The results of models with advanced financial literacy provide new evidence to the study of the impacts of advanced financial literacy on household financial and consumption decisions.

In order to address the potential endogeneity problem caused by reverse causality and omitted variables, this chapter uses two instrumental variables following Li and Qian (2020) to instrument the two endogenous variables separately. On the one hand, only a handful of empirical studies regarding financial literacy use both basic and advanced financial literacy in the empirical analysis. Therefore, empirical evidence about the role of advanced financial literacy is not sufficient. It is a recent innovation that two average financial literacy variables calculated based on geographical features are used to instrument basic and advanced financial literacy separately to address the concern of endogeneity, as discussed in Section 4.2.5. More ways of handling two endogenous financial literacy variables are certainly yet to be discovered.

In conclusion, more than half of the respondents in China can correctly answer simple financial literacy questions. However, only a small fraction of respondents can provide correct answers to sophisticated financial literacy questions, such as the central bank and the core function of stock markets. Without using instrumental variables, the empirical results suggest both basic and advanced financial literacy have positive impacts on absolute household holdings of liquid assets (cash and deposits) and relative

holdings of liquid assets with respect to total household income. For household debt, basic financial literacy has a negative impact on household housing and non-housing debt in the logarithmic form.

For household consumption, apart from education and entertainment consumption, both basic and advanced financial literacy have a positive impact on absolute consumption in the logarithmic form and a negative impact on the relative consumption with respect to household income, when basic and advanced financial literacy are shown to have an impact on specific outcomes. This indicates, in most cases, households with higher financial literacy levels have higher consumption, but they spend a lower fraction of income to satisfy their consumption demands when they have higher basic or advanced financial literacy, keeping other factors constant. The finding of a positive relationship between financial literacy and consumption levels of different categories is consistent with the limited existing evidence shown in Dinkova *et al.* (2021) for Italy and Xie *et al.* (2024) for China. The results for the consumption ratios with respect to household income indicate that more literate households have lower burdens on meeting consumption demands and are more willing to spend a higher proportion of household income in education and entertainment, which is novel in the research of financial literacy.

The empirical analysis under the IV estimation provides ambiguous results for the impacts of basic and advanced financial literacy on household asset and debt decisions. The finding that basic financial literacy has no impact on household decisions on liquid assets violates the mainstream discovery of financial literacy that basic financial literacy plays an important role in household holdings of riskless and risky assets. This violation may lead to the criticism of model specifications (e.g., the inclusion of house prices), the concern of the validity of using average financial literacy as the instrument to solve endogenous problems, the discussion of "competing explanations" (Ray, 2003) that basic and advanced financial literacy are just "alternative causes" and so on. On the one hand, as stated by Klapper *et al.* (2013), the endogeneity problem of financial literacy is not that serious in emerging markets with underdeveloped countries. Therefore, the baseline results are still reliable to some extent. On the other hand, due to data limitations, the use of the county-level average financial literacy is the only plausible

instrumental approach to solve the endogeneity in the models with two endogenous financial literacy variables.

It is worth noting that there are several limitations to this chapter. First, the CFPS datasets used in this chapter started in 2010 and under development. Based on the first five waves from 2010 to 2018, this chapter can only construct unbalanced panel data, meaning that not all observations attend all waves of surveying. Second, due to the limitations of data (i.e., the nature of being unbalanced), only consumption levels are used. To avoid losing many observations, this chapter does not construct consumption growth variables, even if the two main studies inspiring this chapter explore both consumption levels and consumption growth. Thus, for household consumption, this chapter only looks at the relationship between financial literacy (basic and advanced) and household consumption levels. Third, this chapter makes some strict assumptions. For example, this chapter assumes constant financial literacy over the five waves from 2010 to 2018 of the CFPS, following Bucciol and Zarri (2019) and Li (2021). The financial literacy module containing both basic and advanced financial literacy questions is only included in the CFPS 2014.

The estimated results largely support the hypotheses made in the introduction section that basic and advanced financial literacy play a role in household financial and consumption decisions. It is obvious the roles of basic and advanced are not always identical. At the same time, basic and advanced financial literacy do not influence all household consumption decisions. For policymakers, they should make more targeted policies to achieve specific administrative goals. For example, the promotion of basic and advanced financial literacy may not only help households spend a less fraction of household income on food consumption, but also it is an effective way to promote consumption on education and entertainment, potentially to be an investment in human resources. The publication of the *White Paper on Residents' Financial Literacy* and the first *Chinese Household Financial Literacy Report* in the year of 2023 shows that the importance of financial literacy has been highlighted.

This chapter also raises some aspects for future research. The first is how to effectively embed both basic and advanced financial literacy variables in the analysis framework. As discussed in the literature review section, there are many literacy variables, composite (e.g., basic and advanced financial literacy) and specific literacy variables (e.g., debt literacy). Will the inclusion of multiple literacy variables cause problems (e.g., the problem of competing variables)? The second is the exploration of better instrumental variables for financial literacy, especially when there are multiple endogenous financial literacy variables, in the empirical analysis. Third, due to data limitations, this chapter does not explore consumption growth variables. However, constructing such variables would be valuable for comparing the intertemporal consumption elasticities for different consumption categories.

4.6 Appendices

Appendix 4.1 A comparison of three studies using both subjective and objective financial literacy

(1) Empirical study	(2) Dataset	(3) Measuring objective financial literacy	(4) Measuring subjective financial literacy	(5) Correlation between objective and subjective financial literacy
Study 1: Lusardi and Mitchell (2009)	Rand American Life Panel (ALP)	Percentage of correct responses among 13 financial literacy questions	Self-reported financial literacy on a scale from 1 (= very low) to 7 (= very high)	0.366 ($p < 0.001$) estimated by Parker *et al.* (2012)
Study 2: Lind *et al.*, (2020)	A Swedish national representative dataset by the Origo Group	Number of correct answers among four knowledge-based questions	Self-reported financial literacy indicator ranging from 1 (= very low) to 7 (= very high)	0.34
Study 3: Gignac (2022)	Understanding America Study (UAS) for the US	Percentage of correct answers (dividing the number of correct answers by the total number 14, multiplying by 100)	Self-perceived confidence in personal financial ability ranging from 0 (= not at all confident) to 10 (= very confident), namely using an eleven-point scale	0.273 ($p < 0.001$)
	National Financial Capability Survey (NCFS)	Percentage of correct answers to all six financial literacy questions	Self-assessed financial knowledge level scaled from 1 (= very low) to 7 (= very high)	0.266 ($p < 0.001$)

Note: This table evaluates three of many empirical studies using objective and subjective financial literacy simultaneously, with different strategies for measuring both types of financial literacy shown in Column (3) and Column (4) and the correlation between them shown in Column (5). To capture respondents' subjective perceptions, surveys, including the subjective financial literacy modules, usually ask participants to assess their financial literacy on a predetermined scale with different values indicating different levels of self-reported financial literacy.

Appendix 4.2 Variables related to household financial and consumption decisions contained in each wave

Variables	Level	Codes of variables in datasets				
		Wave 2010	Wave 2012	Wave 2014	Wave 2016	Wave 2018
Deposits (yes/no)	Household	ff1				
The number of deposits	Household	ff2				
Cash and deposits (yes/no)	Household		ft1			
The amount of cash and deposits	Household	savings	savings	savings	savings	savings
Stock participation (yes/no)	Household	ff3_s_1	ft4	ft2_s_1		
Stock market values	Household	stock	stock			
Funds participation (yes/no)	Household	ff3_s_2	ft5	ft2_s_2		
Funds market values	Household	funds	funds			
Bonds participation (yes/no)	Household	ff3_s_3		ft2_s_3		
Bonds market values	Household					
Government bonds (yes/no)	Household		ft2			
Government bonds market values	Household		govbond			
Derivatives (yes/no)	Household		ft6			
Derivatives market values	Household		derivative			
Trust products (yes/no)	Household			ft2_s_4		
Foreign exchange products (yes/no)	Household			ft2_s5		
Holding financial assets (yes/no)	Household				ft200	ft200
Financial assets	Household		finance_asset	finance_asset financial_product	finance_asset	finance_asset financial_product
Housing debt	Household	house_debt	house_debt	house_debt	house_debt	house_debt
Non-housing debt	Household	nonhousing_debt	nonhousing_debt	nonhousing_debt	nonhousing_debt	nonhousing_debt
Total consumptive expenditure	Household	pce	pce	pce	pce	pce
Expenditure on food	Household	food	food	food	food	food
Expenditure on clothing	Household	dress	dress	dress	dress	dress
Expenditure on housing	Household	house	house	house	house	house
Expenditure on family equipment and daily necessities	Household	daily	daily	daily	daily	daily
Medical and fitness expenditure	Household	med	med	med	med	med
Expenditure on communication and transportation	Household	trco	trco	trco	trco	trco
Expenditure on education and entertainment	Household	eec	eec	eec	eec	eec

Appendix 4.3 Financial literacy questions

No.	*of questions*	*Options*	*The correct answer*
		Basic financial literacy questions	
1	What is the estimated interest rate for a bank's 1-year term deposit?	(1) ≤ 1%; (2) 1% - 5%; (3) 5% - 10%. (4) ≥ 10%; (5) Do not know	(2) 1% - 5%
2	If you save 10,000 yuan in the bank for one year and the annual deposit rate is 3%, how much will you get after one year?	(1) 10,300; (2) > 10,300; (3) < 10,300; (4) Do not know	(1) 10,300
3	In the above question, if you continue depositing the total amount you get for one more year, how much will you get?	(1) 10,600; (2) > 10,600; (3) < 10,600; (4) Do not know	(2) > 10,600
4	If the annual saving interest rate is 3%, and the inflation rate is 5%. After one year, spending the same amount of money, you will buy:	(1) More things than now (2) The same things (3) Less things (4) Do not know	(3) Less things
5	If Zhang inherits 100,000 yuan today, and Li will inherit 100,000 yuan in 3 years, who gets more inheritance?	(1) Zhang (2) Li (3) They get the same value (4) Do not know	(1) Zhang
		Advanced financial literacy questions	
6	High return, high risk.	(1) True; (2) False; (3) Do not know	(1) True
7	Generally speaking, investing in one stock is less risky than investing in equity funds.	(1) True; (2) False; (3) Do not know	(2) False
8	Which of the following banks is responsible for managing the financial system?	(1) Bank of China (2) Industrial and Commercial Bank of China (3) The People's Bank of China (4) China Construction Bank (5) Do not know	(3) The People's Bank of China
9	Which of the following assets have the highest risk?	(1) Saving accounts (2) Bonds (3) Stocks (4) Funds (5) Do not know	(3) Stocks

10	If you hold the shares of a company, then:	(1) Whether it is long or short-term holding, you are lending money to the company (2) Whether it is long or short-term holding, you are a shareholder of the company (3) When it is long-term holding, you are a shareholder of the company; when it is short-term holding, you are lending money to the company (4) None of the above (5) Do not know	(2) Whether it is long or short-term holding, you are a shareholder of the company
11	Which of the following statements is correct?	(1) Funds with low prices (low unit net worth) will have high yield (2) Mutual funds can invest in several assets, for example, stocks and bonds (3) Mutual funds pay a guaranteed rate of return that depends on their previous performance (4) None of the above (5) Do not know	(2) Mutual funds can invest in several assets, for example, stocks and bonds
12	Which one of the following descriptions of bank financial products is correct?	(1) Like other risky investments, bank financial products have the potential to lose money (2) Bank financial products are as safe as savings, at least they will not be at a loss (3) The expected return of bank financial products is real return (4) None of the above (5) Do not know	(1) Like other risky investments, bank financial products have the potential to lose money
13	Which of the following statements correctly describe the core function of the stock market?	(1) Stock market helps predict stock returns (2) Stock market helps increase stock prices (3) Stock market helps promote stock trading (4) None of the above (5) Do not know	(3) Stock market helps promote stock trading

Note: This chapter follows the method of Huang *et al.* (2020), this correct answers have been checked with the contents in Huang *et al.* (2020).

Appendix 4.4 Details of the explanatory variables

Explanatory variables	*Description*
Basic financial literacy	The number of basic financial literacy questions correctly answered (five in total)
Advanced financial literacy	The number of advanced financial literacy questions correctly answered (eight in total)
Average basic financial literacy within each county	The average basic financial literacy of all respondents living in the same county
Average advanced financial literacy within each county	The average advanced financial literacy of all respondents living in the same county
Risk attitude	A set of variables indicating households' risk attitude [1] Prefer projects with high/medium risks and high/medium returns [2] Prefer projects with low risk and low returns [3] Prefer projects with no risk
The log of household income	The logarithm of household members.
Household income quintiles	A set of variables indicating households' income position by ranking the household income values from the lowest to the highest, and equally dividing all respondents into give groups. [1] Quintile 1 (0 – 20%) with the lowest income values [2] Quintile 2 (20% – 40%) [3] Quintile 3 (40% – 60%) [4] Quintile 4 (60% – 80%) [5] Quintile 5 (80% – 40%) with the highest income values
Family size	The number of household members.
Old dependency	The number of old household members (over sixty five years old) divided by the total number of household members.
Young dependency	The number of young household members (under sixteen years ole) divided by the total number of household members.
House ownership	A dummy variable with 1 = owing at least a house and 0 = owing no house.
The characteristics of household economic respondent*	
The age of household economic respondent	The age of household economic respondent.
The square of the age of household economic respondent	(The age of household economic respondent)^2.
Female respondent	A dummy variable with 1 = the respondent being female and 0 = male.
With a degree	A dummy variable with 1 = having a degree and 0 = not having a degree.
Attended school	A dummy variable with 1 = attended school and 0 = never attended school.
Employment status	A dummy variable with 1 = employed and 0 = unemployed.
Health status	A dummy variable with 1 = healthy and 0 = unhealthy. (There is one question asking respondents to assess the health status by themselves. This variable is coded 0 if they report an unhealthy status and 1 otherwise.)
Hukou status	A dummy variable with 1 = agricultural and 0 = non-agricultural. (The Hukou system is a special administrative registration system. People can have an agricultural hukou or a non-agricultural hukou.)
Marital status	A dummy variable with 1 = married and 0 = unmarried.
Minority	A dummy variable with 1 = an ethnic minority and 0 = not a minority.
Party membership	A dummy variable with 1 = a member of the Chinese Communist Party and 0 = not a member of the Chinese Communist Party.

* Household economic respondent is the household member who are most familiar with household economic conditions.

Appendix 4.5 The summary of the estimation results shown in Appendix 4.6 to Appendix 4.33

	Type of estimation results (C = Coefficients; AME = Average marginal effects)	*Estimation methods*	*The form of dependent variables*	*With instrumental variables?*	*Financial literacy variables*
Appendix 4.6	C	Tobit and GLS	The logarithmic form	No	Basic financial literacy
Appendix 4.7	AME	Tobit			
Appendix 4.8	C	Tobit and GLS			Advanced financial literacy
Appendix 4.9	AME	Tobit			
Appendix 4.10	C	Tobit and GLS			Basic and advanced financial literacy
Appendix 4.11	AME	Tobit			
Appendix 4.12	First-stage C	Tobit and GLS	Not applicable	Yes	Not applicable
Appendix 4.13	First-stage C	Tobit and GLS			Not applicable
Appendix 4.14	C	Tobit and GLS	The logarithmic form		Basic financial literacy
Appendix 4.15	AME	Tobit			
Appendix 4.16	C	Tobit and GLS			Advanced financial literacy
Appendix 4.17	AME	Tobit			
Appendix 4.18	C	Tobit and GLS			Basic and advanced financial literacy
Appendix 4.19	AME	Tobit			
Appendix 4.20	C	Tobit and GLS	Ratios with respect to total household income		Basic financial literacy
Appendix 4.21	AME	Tobit			
Appendix 4.22	C	Tobit and GLS			Advanced financial literacy
Appendix 4.23	AME	Tobit			
Appendix 4.24	C	Tobit and GLS			Basic and advanced financial literacy
Appendix 4.25	AME	Tobit			
Appendix 4.26	First-stage C	Tobit and GLS	Not applicable	Yes	Not applicable
Appendix 4.27	First-stage C	Tobit and GLS			Not applicable
Appendix 4.28	C	Tobit and GLS	Ratios with respect to total household income		Basic financial literacy
Appendix 4.29	AME	Tobit			
Appendix 4.30	C	Tobit and GLS			Advanced financial literacy
Appendix 4.31	AME	Tobit			
Appendix 4.32	C	Tobit and GLS			Basic and advanced financial literacy
Appendix 4.33	AME	Tobit			

Appendix 4.6 Baseline models using basic financial literacy for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Basic financial literacy	0.791***	-0.974***	-1.986***	0.063***	0.187***	0.593***	0.055***	0.079**	0.058***	0.053***	0.095***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.474***	2.202***	0.865	0.265***	0.291***	0.784***	-0.042	0.037	0.123***	0.060***	0.272***
(2) Low risks/returns	0.603***	1.460	-0.691	0.070	0.169***	0.684***	-0.015	0.023	0.031	0.009	0.126***
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.326***	0.961	-2.106***	0.326***	0.725***	0.575***	0.239***	0.092	0.214***	0.317***	0.298***
(2) Quintile 3 (40 - 60%)	2.182***	1.520*	-2.947***	0.590***	1.008***	1.108***	0.396***	0.341***	0.393***	0.481***	0.503***
(3) Quintile 4 (60 - 80%)	3.069***	4.104***	-3.783***	0.987***	1.271***	1.399***	0.590***	0.413***	0.568***	0.628***	0.724***
(4) Quintile 5 (80 - 100%) Highest	3.875***	7.561***	-1.827**	1.545***	1.551***	2.222***	0.852***	0.612***	0.866***	0.833***	1.032***
Age	-0.072***	0.235	0.415***	-0.032***	-0.026**	-0.031	-0.005	-0.018	-0.009***	-0.003	0.006
$Age^2/100$	0.087***	-0.448***	-0.714***	0.021***	0.003	-0.002	0.005	0.039**	0.007**	0.006	-0.019**
Female respondent	0.042	0.617	-1.068**	0.049	0.223***	0.559***	0.105***	0.279***	0.079***	0.011	0.044
Family size	-0.282***	0.729***	0.999***	0.081***	0.133***	0.542***	0.011	0.260***	0.081***	0.068***	0.124***
With a degree	1.331***	1.845	-4.672***	0.442***	0.527***	2.107***	0.351***	0.863***	0.308***	0.156***	0.509***
Ever attended school	0.559***	-1.452	-2.867***	0.185***	0.249***	1.302***	0.229***	0.380***	0.159***	0.128***	0.354***
Employment status	0.430***	1.015	0.224	0.071*	0.224***	0.389***	0.021	-0.167**	0.017	-0.052**	0.110***
Health status	0.453***	-0.323	-2.985***	0.070	0.087	0.206	-0.026	-1.073***	-0.049***	0.037	-0.019
Hukou status	-0.248	2.229***	2.220***	0.065	-0.068	-0.744***	-0.208***	0.067	-0.078***	-0.176***	-0.011
Marital status	0.757***	2.907***	-0.623	0.296***	0.172**	0.200	0.205***	0.520***	0.188***	0.208***	0.162***
Minority	-0.577*	3.190**	2.060*	-0.057	0.160*	0.554**	-0.053	-0.331*	-0.043	-0.053	0.035
Old dependency	0.945***	-6.360***	-2.660**	-0.320***	-0.837***	-0.825***	-0.148**	0.901***	-0.055*	-0.096***	-0.529***
Young dependency	0.292	5.284***	-2.317	0.180*	0.458***	5.576***	0.018	-0.113	0.002	0.166***	-0.118
House ownership	0.303**			0.181***	0.099*	-0.142	-0.248***	0.012	-0.002	-0.028	0.039
Party membership	0.402**	2.179***	1.126	0.144***	0.251***	0.611***	-0.056	0.217**	0.089***	0.010	0.100***
Intercept	0.899	-33.791***	-14.105***	6.718***	5.009***	0.296	5.365***	5.060***	9.496***	8.239***	6.354***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.7 Average marginal effects (ME) at both extensive margins and intensive margins of baseline models using basic financial literacy for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Basic financial literacy	0.030***	-0.011**	-0.026***	0.000**	0.000***	0.027***	0.000*	0.001*
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.018**	0.024**	0.012	0.000***	0.000***	0.035***	0.000	0.000
(2) Low risks/returns	0.023***	0.015	-0.009	0.000	0.000**	0.031***	0.000	0.000
Panel B: Intensive margins								
Basic financial literacy	0.548***	-0.148**	-0.327***	0.063***	0.186***	0.434***	0.055**	0.074*
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.328**	0.334**	0.144	0.265***	0.289***	0.575***	-0.042	0.035
(2) Low risks/returns	0.419***	0.218	-0.111	0.070	0.168**	0.499***	-0.015	0.022

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.8 Baseline models using advanced financial literacy for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Advanced financial literacy	0.553***	0.780**	-0.727**	0.085***	0.127***	0.622***	0.053**	0.048	0.068***	0.047***	0.121***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.521***	1.197	0.265	0.243***	0.307***	0.684***	-0.047	0.047	0.109***	0.057**	0.242***
(2) Low risks/returns	0.673***	0.655	-1.197	0.055	0.189***	0.629***	-0.017	0.034	0.022	0.009	0.107***
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.382***	0.821	-2.268***	0.329***	0.737***	0.602***	0.243***	0.098	0.217***	0.320***	0.301***
(2) Quintile 3 (40 - 60%)	2.273***	1.272	-3.228***	0.593***	1.028***	1.144***	0.402***	0.352***	0.397***	0.486***	0.506***
(3) Quintile 4 (60 - 80%)	3.173***	3.754***	-4.147***	0.988***	1.294***	1.435***	0.596***	0.426***	0.571***	0.634***	0.726***
(4) Quintile 5 (80 - 100%) Highest	3.987***	7.064***	-2.282***	1.544***	1.577***	2.249***	0.858***	0.627***	0.868***	0.839***	1.033***
Age	-0.070**	0.247	0.421***	-0.031***	-0.026**	-0.028	-0.005	-0.017	-0.009***	-0.003	0.007
$Age^2/100$	0.084***	-0.450***	-0.713***	0.021***	0.003	-0.003	0.005	0.038**	0.007**	0.006	-0.019**
Female respondent	0.081	0.638	-1.111**	0.055	0.232***	0.599***	0.109***	0.282***	0.083***	0.014	0.052*
Family size	-0.296***	0.791***	1.050***	0.081***	0.130***	0.538***	0.010	0.258***	0.081***	0.067***	0.124***
With a degree	1.480***	0.533	-5.544***	0.424***	0.566***	2.065***	0.350***	0.883***	0.298***	0.158***	0.488***
Ever attended school	0.710***	-2.069**	-3.419***	0.184***	0.286***	1.350***	0.235***	0.397***	0.162***	0.135***	0.356***
Employment status	0.409***	0.997	0.220	0.068*	0.219***	0.372***	0.019	-0.169**	0.015	-0.054***	0.107***
Health status	0.483***	-0.378	-3.117***	0.073	0.095	0.230*	-0.023	-1.069***	-0.047**	0.040	-0.016
Hukou status	-0.255	2.517***	2.344***	0.073*	-0.070	-0.706***	-0.205***	0.065	-0.074***	-0.175***	-0.002
Marital status	0.828***	2.845***	-0.746	0.302***	0.187***	0.245	0.210***	0.527***	0.193***	0.212***	0.169***
Minority	-0.659**	3.258**	2.253*	-0.065	0.141	0.489**	-0.060	-0.339*	-0.050	-0.059	0.024
Old dependency	1.002***	-6.412***	-2.753**	-0.312***	-0.825***	-0.778***	-0.143*	0.906***	-0.050*	-0.092**	-0.522***
Young dependency	0.257	5.306***	-2.307	0.178*	0.451***	5.557***	0.016	-0.116	0.000	0.164***	-0.120
House ownership	0.304**			0.181***	0.100**	-0.138	-0.248***	0.013	-0.001	-0.027	0.040
Party membership	0.414**	2.073***	1.076	0.142***	0.253***	0.601***	-0.056	0.219**	0.088***	0.010	0.097***
Intercept	0.600	-33.107***	-13.290***	6.704***	4.943***	0.139	5.347***	5.029***	9.483***	8.221***	6.335***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.9 Average marginal effects (ME) at both the extensive margin and the intensive margin of baseline models using advanced financial literacy for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Advanced financial literacy	0.021***	0.009*	-0.010*	0.000***	0.000***	0.028***	0.000*	0.000
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.020***	0.013	0.004	0.000***	0.000***	0.031***	0.000	0.000
(2) Low risks/returns	0.026***	0.007	-0.015	0.000	0.000**	0.028***	0.000	0.000
Panel B: Intensive margins								
Advanced financial literacy	0.383***	0.119*	-0.120*	0.085***	0.126***	0.456***	0.053*	0.045
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.361***	0.182	0.044	0.243***	0.305***	0.502***	-0.047	0.044
(2) Low risks/returns	0.468***	0.098	-0.193	0.055	0.188**	0.460***	-0.017	0.032

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.10 Baseline models with basic and advanced financial literacy variables for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Basic financial literacy	0.693***	-1.525***	-2.067***	0.037*	0.166***	0.419***	0.042*	0.072*	0.038***	0.042***	0.057***
Advanced financial literacy	0.250***	1.409***	0.206	0.069***	0.053*	0.438***	0.035	0.016	0.052***	0.029**	0.096***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.359**	1.568**	0.775	0.234***	0.266***	0.583***	-0.057	0.030	0.099***	0.047**	0.228***
(2) Low risks/returns	0.517***	0.978	-0.760	0.046	0.151**	0.534***	-0.026	0.018	0.013	-0.000	0.094**
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.322***	0.952	-2.108***	0.325***	0.724***	0.572***	0.238***	0.092	0.214***	0.316***	0.298***
(2) Quintile 3 (40 - 60%)	2.170***	1.472*	-2.955***	0.586***	1.006***	1.092***	0.394***	0.340***	0.391***	0.479***	0.500***
(3) Quintile 4 (60 - 80%)	3.047***	3.991***	-3.799***	0.980***	1.267***	1.372***	0.586***	0.412***	0.565***	0.626***	0.719***
(4) Quintile 5 (80 - 100%) Highest	3.837***	7.370***	-1.856**	1.533***	1.544***	2.172***	0.846***	0.610***	0.861***	0.828***	1.024***
Age	-0.071***	0.242	0.416***	-0.031***	-0.025**	-0.028	-0.005	-0.017	-0.009***	-0.003	0.007
$Age^2/100$	0.087***	-0.448***	-0.713***	0.021***	0.003	-0.003	0.005	0.039**	0.007**	0.006	-0.019**
Female respondent	0.057	0.719	-1.058**	0.054	0.227***	0.585***	0.107***	0.280***	0.082***	0.012	0.050*
Family size	-0.278***	0.754***	1.002***	0.082***	0.134***	0.547***	0.011	0.260***	0.081***	0.068***	0.125***
With a degree	1.215***	1.172	-4.766***	0.411***	0.503***	1.907***	0.335***	0.856***	0.284***	0.143***	0.465***
Ever attended school	0.522**	-1.654	-2.896***	0.175***	0.241***	1.237***	0.224***	0.377***	0.151***	0.124***	0.339***
Employment status	0.422***	0.992	0.222	0.069*	0.222***	0.381***	0.020	-0.167**	0.015	-0.053**	0.108***
Health status	0.457***	-0.288	-2.981***	0.071	0.088	0.214	-0.025	-1.073***	-0.048***	0.038	-0.018
Hukou status	-0.211	2.435***	2.251***	0.075*	-0.060	-0.682***	-0.202***	0.069	-0.071***	-0.172***	0.002
Marital status	0.766***	2.934***	-0.616	0.299***	0.174**	0.214	0.206***	0.521***	0.189***	0.209***	0.165***
Minority	-0.593*	3.075**	2.038*	-0.061	0.156	0.524**	-0.056	-0.333*	-0.047	-0.055	0.029
Old dependency	0.962***	-6.301***	-2.652**	-0.314***	-0.833***	-0.799***	-0.146*	0.902***	-0.052*	-0.094**	-0.524***
Young dependency	0.290	5.317***	-2.312	0.179*	0.458***	5.583***	0.017	-0.113	0.002	0.165***	-0.118
House ownership	0.302**			0.181***	0.099*	-0.143	-0.249***	0.012	-0.002	-0.028	0.039
Party membership	0.389**	2.101***	1.112	0.141***	0.248***	0.588***	-0.058	0.216**	0.086***	0.009	0.095***
Intercept	0.913	-33.698***	-14.092***	6.721***	5.011***	0.303	5.365***	5.061***	9.499***	8.240***	6.359***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.11 Average marginal effects (ME) at both extensive margins and intensive margins of baseline models using basic and advanced financial literacy variables for full sample (without instrumental variables) when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Basic financial literacy	0.026***	-0.017***	-0.028***	0.000	0.000***	0.019***	0.000	0.001
Advanced financial literacy	0.010**	0.016***	0.003	0.000**	0.000	0.020***	0.000	0.000
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.014*	0.017*	0.011	0.000***	0.000***	0.026***	0.000	0.000
(2) Low risks/returns	0.020**	0.011	-0.010	0.000	0.000*	0.024***	0.000	0.000
Panel B: Intensive margins								
Basic financial literacy	0.481***	-0.233***	-0.341***	0.037	0.165***	0.307***	0.042	0.068
Advanced financial literacy	0.174**	0.215***	0.034	0.069**	0.053	0.321***	0.034	0.015
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.249*	0.238*	0.129	0.234***	0.265***	0.427***	-0.057	0.028
(2) Low risks/returns	0.360**	0.147	-0.122	0.046	0.150*	0.390***	-0.026	0.017

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.12 First-stage regression results when the dependent variables are in the logarithmic form (with house ownership) when the dependent variables are in the logarithmic form

Coefficients	Full sample		Household economic respondent aged 16-40		Household economic respondent aged 40-60		Household economic respondent aged 60 and over	
	(1) Basic financial literacy	(2) Advanced financial literacy	(3) Basic financial literacy	(4) Advanced financial literacy	(5) Basic financial literacy	(6) Advanced financial literacy	(7) Basic financial literacy	(8) Advanced financial literacy
Average basic financial literacy within each county	0.180***		0.132***		0.197***		0.190***	
Average advanced financial literacy within each		0.150***		0.113***		0.181***		0.137***
Risk attitude (the base category: no risks)								
(1) High/medium risks/returns	0.472***	0.600***	0.444***	0.546***	0.469***	0.597***	0.463***	0.609***
(2) Low risks/return	0.410***	0.473***	0.371***	0.439***	0.383***	0.418***	0.472***	0.567***
Household income quintiles								
(1) Quintile 2 (20 - 40%)	0.128***	0.056**	-0.002	-0.038	0.167***	0.098***	0.126**	0.049
(2) Quintile 3 (40 - 60%)	0.236***	0.130***	0.109**	-0.046	0.249***	0.203***	0.260***	0.138***
(3) Quintile 4 (60 - 80%)	0.294***	0.199***	0.089	0.040	0.282***	0.217***	0.407***	0.265***
(4) Quintile 5 (80 - 100%) Highest	0.351***	0.291***	0.205***	0.184***	0.353***	0.313***	0.399***	0.310***
Age	0.002	-0.002	-0.005	0.016	-0.076	0.007	-0.044	-0.051
$Age^2/100$	-0.009	-0.006	0.021	-0.004	0.065	-0.022	0.020	0.031
Female respondent	-0.013	-0.076**	0.009	-0.073	0.006	-0.067	-0.056	-0.087*
Family size	-0.037***	-0.030***	-0.002	-0.041**	-0.050***	-0.044***	-0.015	-0.008
With a degree	0.583***	0.661***	0.984***	0.991***	0.531***	0.588***	0.346***	0.529***
Attended school	0.335***	0.254***	0.594***	0.508***	0.261***	0.176***	0.365***	0.301***
Employment status	-0.017	0.033	0.064	0.002	0.018	0.063*	-0.162***	-0.122**
Health status	0.069**	0.011	0.015	-0.104	0.107**	-0.024	0.032	0.057
Hukou status	-0.132***	-0.206***	-0.089	-0.199***	-0.098*	-0.174***	-0.181**	-0.158**
Marital status	0.116***	0.004	0.008	-0.029	0.114*	0.005	0.115*	-0.014
Minority	-0.047	0.028	0.026	-0.055	-0.191	0.051	0.016	0.015
Old dependency	0.021	-0.073	-0.426**	-0.159	-0.002	0.051	0.089	-0.045
Young dependency	-0.023	0.005	-0.180	-0.320*	-0.042	-0.104	-0.210	0.112
House ownership	0.035	0.026	-0.091**	0.015	0.113***	0.022	0.034	0.053
Party membership	0.074*	0.077**	-0.064	0.030	0.083	0.037	0.100	0.128**
Intercept	-0.676***	-0.348**	-0.817	-0.782	1.348	-0.292	1.086	1.070
Number of observations	14195	14195	3222	3222	6717	6717	4256	4256

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.13 First-stage regression results when the dependent variables are in the logarithmic form (without house ownership)

Coefficients	Full sample		Household economic respondent aged 16-40		Household economic respondent aged 40-60		Household economic respondent aged 60 and over	
	(1) Basic financial literacy	(2) Advanced financial literacy	(3) Basic financial literacy	(4) Advanced financial literacy	(5) Basic financial literacy	(6) Advanced financial literacy	(7) Basic financial literacy	(8) Advanced financial literacy
Average basic financial literacy within each county	0.179***		0.133***		0.196***		0.190***	
Average advanced financial literacy within each		0.150***		0.113***		0.181***		0.136***
Risk attitude (the base category: no risks)								
(1) High/medium risks/returns	0.473***	0.601***	0.440***	0.547***	0.473***	0.598***	0.464***	0.611***
(2) Low risks/return	0.411***	0.473***	0.368***	0.440***	0.387***	0.419***	0.472***	0.567***
Household income quintiles								
(1) Quintile 2 (20 - 40%)	0.128***	0.056**	-0.003	-0.038	0.169***	0.098***	0.126**	0.050
(2) Quintile 3 (40 - 60%)	0.237***	0.130***	0.108**	-0.046	0.254***	0.204***	0.262***	0.140***
(3) Quintile 4 (60 - 80%)	0.296***	0.200***	0.084	0.040	0.290***	0.218***	0.407***	0.265***
(4) Quintile 5 (80 - 100%) Highest	0.354***	0.293***	0.195***	0.186***	0.362***	0.315***	0.402***	0.313***
Age	0.003	-0.002	-0.002	0.016	-0.076	0.007	-0.042	-0.048
$Age^2/100$	-0.009	-0.006	0.016	-0.004	0.065	-0.022	0.019	0.029
Female respondent	-0.013	-0.075**	0.007	-0.073	0.007	-0.067	-0.056	-0.086*
Family size	-0.036***	-0.029***	-0.009	-0.040**	-0.048***	-0.044***	-0.014	-0.006
With a degree	0.584***	0.662***	0.982***	0.991***	0.535***	0.589***	0.348***	0.532***
Attended school	0.334***	0.254***	0.595***	0.508***	0.258***	0.175***	0.365***	0.301***
Employment status	-0.017	0.033	0.066	0.002	0.020	0.063*	-0.161***	-0.122**
Health status	0.070**	0.012	0.011	-0.103	0.110**	-0.024	0.033	0.058
Hukou status	-0.133***	-0.207***	-0.079	-0.200***	-0.094*	-0.174***	-0.181**	-0.158**
Marital status	0.118***	0.006	0.004	-0.029	0.125**	0.008	0.116*	-0.012
Minority	-0.048	0.027	0.027	-0.055	-0.192	0.050	0.014	0.012
Old dependency	0.021	-0.073	-0.425**	-0.159	-0.001	0.051	0.087	-0.048
Young dependency	-0.024	0.004	-0.182	-0.320*	-0.044	-0.104	-0.210	0.111
Party membership	0.075*	0.078**	-0.063	0.030	0.088	0.038	0.102*	0.130**
Intercept	-0.665***	-0.341**	-0.899	-0.767	1.405	-0.281	1.044	1.004
Number of observations	14195	14195	3222	3222	6717	6717	4256	4256

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.14 IV models using basic financial literacy for full sample when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Basic financial literacy	1.828***	0.829	-8.270***	0.529***	0.690***	1.400***	-0.210*	0.252	0.305***	0.352***	0.498***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.054	1.289	4.027***	0.028	0.035	0.372*	0.093	-0.051	-0.003	-0.093**	0.067
(2) Low risks/returns	0.149	0.677	2.043*	-0.134*	-0.051	0.331	0.101	-0.053	-0.077**	-0.122***	-0.049
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.170***	0.697	-1.181*	0.256***	0.651***	0.457***	0.279***	0.066	0.178***	0.272***	0.241***
(2) Quintile 3 (40 - 60%)	1.893***	1.032	-1.215	0.459***	0.871***	0.888***	0.472***	0.293***	0.326***	0.397***	0.396***
(3) Quintile 4 (60 - 80%)	2.704***	3.489***	-1.590*	0.822***	1.097***	1.122***	0.686***	0.352***	0.483***	0.523***	0.588***
(4) Quintile 5 (80 - 100%) Highest	3.423***	6.800***	0.859	1.340***	1.338***	1.881***	0.972***	0.536***	0.762***	0.702***	0.866***
Age	-0.070**	0.239	0.398***	-0.031***	-0.025**	-0.030	-0.006	-0.017	-0.009**	-0.002	0.007
$Age^2/100$	0.091***	-0.440***	-0.738***	0.023***	0.005	0.002	0.004	0.039***	0.009**	0.007	-0.017*
Female respondent	0.033	0.606	-1.013*	0.046	0.219***	0.553***	0.107***	0.277***	0.077***	0.008	0.041
Family size	-0.229***	0.817***	0.691***	0.105***	0.158***	0.582***	-0.004	0.269***	0.093***	0.083***	0.144***
With a degree	0.650*	0.640	-0.442	0.137	0.195	1.572***	0.525***	0.749***	0.145***	-0.041	0.243**
Ever attended school	0.171	-2.146*	-0.433	0.010	0.060	0.997***	0.328***	0.315**	0.066*	0.016	0.203***
Employment status	0.448***	1.049*	0.123	0.079*	0.233***	0.405***	0.016	-0.164**	0.021	-0.047**	0.117***
Health status	0.370**	-0.471	-2.481***	0.033	0.048	0.144	-0.005	-1.087***	-0.068***	0.014	-0.050
Hukou status	-0.083	2.520***	1.216*	0.140***	0.012	-0.616***	-0.250***	0.095	-0.039*	-0.128***	0.053
Marital status	0.644***	2.704***	0.079	0.246***	0.117	0.111	0.234***	0.502***	0.161***	0.175***	0.118***
Minority	-0.502	3.331**	1.581	-0.024	0.195*	0.613**	-0.072	-0.319*	-0.026	-0.032	0.064
Old dependency	0.916***	-6.416***	-2.485*	-0.332***	-0.851***	-0.848***	-0.141*	0.896***	-0.062*	-0.104**	-0.543***
Young dependency	0.335	5.353***	-2.576	0.199*	0.478***	5.611***	0.007	-0.106	0.013	0.178***	-0.102
House ownership	0.278**			0.171***	0.087	-0.163	-0.243***	0.008	-0.008	-0.035	0.028
Party membership	0.333**	2.042**	1.586**	0.114**	0.217***	0.556***	-0.038	0.206**	0.072***	-0.009	0.071*
Intercept	1.536*	-32.682***	-17.835***	7.001***	5.316***	0.795	5.204***	5.166***	9.648***	8.422***	6.604***
Number of observations	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.15 Average marginal effects (ME) at both extensive margins and intensive margins of IV models using basic financial literacy for full sample when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Basic financial literacy	0.070***	0.009	-0.116***	0.000***	0.001**	0.063***	0.000	0.002
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.002	0.014	0.057***	0.000	0.000	0.017	0.000	-0.001
(2) Low risks/returns	0.006	0.007	0.027	0.000	0.000	0.015	0.000	-0.001
Panel B: Intensive margins								
Basic financial literacy	1.255***	0.127	-1.531***	0.529***	0.683***	1.015***	-0.210	0.236
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.037	0.197	0.754***	0.028	0.035	0.270	0.093	-0.048
(2) Low risks/returns	0.103	0.102	0.366	-0.134	-0.050	0.240	0.101	-0.049

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.16 IV models using advanced financial literacy for full sample when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Advanced financial literacy	2.452***	0.810	-7.485***	0.633***	0.661***	1.363***	0.054	0.339	0.394***	0.380***	1.018***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.692*	1.178	4.561***	-0.107	-0.035	0.211	-0.048	-0.139	-0.100**	-0.156***	-0.380***
(2) Low risks/returns	-0.286	0.640	2.203*	-0.222***	-0.081	0.255	-0.017	-0.113	-0.143***	-0.159***	-0.378***
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.248***	0.819	-1.818***	0.290***	0.700***	0.551***	0.243***	0.078	0.195***	0.297***	0.287***
(2) Quintile 3 (40 - 60%)	1.970***	1.267	-2.175***	0.504***	0.945***	1.030***	0.402***	0.305***	0.346***	0.433***	0.427***
(3) Quintile 4 (60 - 80%)	2.721***	3.747***	-2.569***	0.857***	1.169***	1.264***	0.596***	0.357***	0.496***	0.555***	0.580***
(4) Quintile 5 (80 - 100%) Highest	3.325***	7.053***	0.024	1.351***	1.394***	1.997***	0.858***	0.525***	0.758***	0.722***	0.823***
Age	-0.058*	0.247	0.373***	-0.028***	-0.022*	-0.024	-0.005	-0.016	-0.007*	-0.001	0.015
$Age^2/100$	0.086***	-0.450***	-0.717***	0.021**	0.003	-0.002	0.005	0.039**	0.008**	0.006	-0.019**
Female respondent	0.187	0.640	-1.496**	0.086**	0.262***	0.641***	0.109***	0.298***	0.102***	0.033	0.131***
Family size	-0.220***	0.792***	0.795***	0.103***	0.151***	0.566***	0.010	0.270***	0.093***	0.080***	0.157***
With a degree	0.120	0.511	-0.601	0.031	0.182	1.532***	0.350***	0.674***	0.064	-0.081	-0.199*
Ever attended school	0.167	-2.078*	-1.424	0.027	0.133	1.137***	0.234***	0.313**	0.068**	0.039	0.067
Employment status	0.346**	0.996	0.459	0.050	0.202***	0.348***	0.019	-0.178**	0.004	-0.065***	0.075**
Health status	0.454***	-0.379	-2.993***	0.065	0.087	0.219	-0.023	-1.073***	-0.051**	0.035	-0.033
Hukou status	0.169	2.525***	0.834	0.196***	0.049	-0.541***	-0.205***	0.130	-0.001	-0.100***	0.199***
Marital status	0.828***	2.846***	-0.742	0.303***	0.188***	0.245	0.210***	0.528***	0.193***	0.212***	0.147***
Minority	-0.737**	3.257**	2.534*	-0.088	0.118	0.459*	-0.060	-0.352*	-0.064	-0.073	-0.052
Old dependency	1.153***	-6.409***	-3.299**	-0.267***	-0.783***	-0.720***	-0.143*	0.929***	-0.024	-0.065	-0.507***
Young dependency	0.269	5.306***	-2.370	0.184	0.455***	5.564***	0.016	-0.114	0.004	0.166***	-0.099
House ownership	0.268*			0.172***	0.090*	-0.152	-0.248***	0.007	-0.008	-0.034	0.040
Party membership	0.263	2.070**	1.638**	0.099**	0.211***	0.542***	-0.056	0.196**	0.062***	-0.016	0.025
Intercept	1.153	-33.098***	-15.181***	6.861***	5.099***	0.359	5.347***	5.113***	9.577***	8.318***	6.546***
Number of observations	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.17 Average marginal effects (ME) at both the extensive margin and the intensive margin of IV models using advanced financial literacy for full sample when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Advanced financial literacy	0.095***	0.009	-0.106***	0.000***	0.001**	0.062***	0.000	0.003
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.027	0.013	0.066**	0.000	0.000	0.010	0.000	-0.001
(2) Low risks/returns	-0.011	0.007	0.029	0.000	0.000	0.012	0.000	-0.001
Panel B: Intensive margins								
Advanced financial literacy	1.656***	0.123	-1.366***	0.633***	0.656***	0.989***	0.054	0.317
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.465	0.179	0.844**	-0.107	-0.035	0.153	-0.048	-0.130
(2) Low risks/returns	-0.195	0.096	0.387	-0.222**	-0.080	0.185	-0.017	-0.106

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.18 IV models with basic and advanced financial literacy variables for full sample when the dependent variables are in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Basic financial literacy	0.683	0.352	-8.431***	0.302**	0.621***	1.094**	-0.541***	0.097	0.131*	0.259***	0.245*
Advanced financial literacy	1.846***	0.561	-0.171	0.380**	0.132	0.341	0.504**	0.255	0.282***	0.163*	0.410***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.655*	1.159	4.219***	-0.100	-0.016	0.245	-0.061	-0.135	-0.095**	-0.150***	-0.069
(2) Low risks/returns	-0.284	0.588	2.198*	-0.227***	-0.088	0.307	-0.008	-0.113	-0.144***	-0.163***	-0.147**
Household income quintiles											
(1) Quintile 2 (20 - 40%)	1.209***	0.733	-1.145*	0.263***	0.652***	0.615***	0.293***	0.071	0.185***	0.275***	0.250***
(2) Quintile 3 (40 - 60%)	1.916***	1.093	-1.139	0.461***	0.869***	1.127***	0.483***	0.295***	0.330***	0.397***	0.403***
(3) Quintile 4 (60 - 80%)	2.669***	3.545***	-1.486*	0.811***	1.091***	1.383***	0.682***	0.346***	0.479***	0.518***	0.584***
(4) Quintile 5 (80 - 100%) Highest	3.283***	6.864***	1.001	1.307***	1.323***	2.173***	0.940***	0.515***	0.743***	0.687***	0.841***
Age	-0.061**	0.240	0.395***	-0.029***	-0.024**	-0.025	-0.003	-0.016	-0.007*	-0.001	0.009
$Age^2/100$	0.088***	-0.441***	-0.737***	0.023**	0.005	0.003	0.003	0.039**	0.008**	0.007	-0.017*
Female respondent	0.146	0.656	-1.025*	0.069*	0.227***	0.678***	0.138***	0.293***	0.094***	0.018	0.066*
Family size	-0.214***	0.813***	0.675***	0.109***	0.160***	0.559***	-0.000	0.271***	0.095***	0.085***	0.146***
With a degree	0.081	0.535	-0.208	0.014	0.146	1.536***	0.382***	0.669***	0.057	-0.096	0.115
Ever attended school	0.070	-2.125*	-0.322	-0.014	0.047	1.010***	0.308***	0.300**	0.050	0.005	0.179**
Employment status	0.369**	1.054	0.134	0.063	0.228***	0.379***	-0.007	-0.175**	0.009	-0.054**	0.101***
Health status	0.433**	-0.426	-2.461***	0.045	0.051	0.136	0.014	-1.079***	-0.059***	0.018	-0.037
Hukou status	0.144	2.548***	1.148	0.188***	0.030	-0.563***	-0.191***	0.127	-0.005	-0.107***	0.101**
Marital status	0.767***	2.726***	0.093	0.270***	0.124*	0.120	0.269***	0.518***	0.179***	0.185***	0.144***
Minority	-0.659*	3.254**	1.566	-0.056	0.185*	0.599**	-0.116	-0.341*	-0.050	-0.046	0.028
Old dependency	1.090***	-6.420***	-2.512*	-0.296***	-0.840***	-0.840***	-0.091	0.921***	-0.036	-0.089**	-0.506***
Young dependency	0.300	5.387***	-2.577	0.194*	0.477***	5.975***	-0.003	-0.110	0.008	0.175***	-0.109
House ownership	0.272*			0.170***	0.086	-0.146	-0.244***	0.007	-0.009	-0.035	0.027
Party membership	0.263	2.032**	1.605**	0.099**	0.211***	0.570***	-0.057	0.196**	0.062***	-0.016	0.057
Intercept	1.370*	-32.797***	-17.974***	6.971***	5.312***	0.398	5.145***	5.145***	9.623***	8.410***	6.573***
Number of observations	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195	14195

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.19 Average marginal effects (ME) at both extensive margins and intensive margins of IV models using basic and advanced financial literacy variables for full sample when the dependent variables are in the logarithmic form

Average marginal effects	(1) The log of the amount of cash and deposits	(2) The log of housing debt	(3) The log of non-housing debt	(4) The log of expenditure on equipment and daily necessities	(5) The log of expenditure on clothing	(6) The log of expenditure on education and entertainment	(7) The log of expenditure on housing	(8) The log of medical and fitness expenditure
Panel A: Extensive margins								
Basic financial literacy	0.026	0.004	-0.118***	0.000*	0.001*	0.049*	0.000	0.001
Advanced financial literacy	0.071**	0.006	-0.002	0.000*	0.000	0.015	0.000	0.003
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.025	0.013	0.060**	0.000	0.000	0.011	0.000	-0.001
(2) Low risks/returns	-0.011	0.006	0.029	0.000	0.000	0.014	0.000	-0.001
Panel B: Intensive margins								
Basic financial literacy	0.465	0.054	-1.571**	0.302*	0.616**	0.784*	-0.540**	0.091
Advanced financial literacy	1.256**	0.086	-0.032	0.380*	0.131	0.245	0.503*	0.239
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.444	0.177	0.795**	-0.100	-0.016	0.176	-0.061	-0.126
(2) Low risks/returns	-0.195	0.089	0.397	-0.227**	-0.087	0.221	-0.008	-0.106

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.20 Baseline models using basic financial literacy for full sample (without instrumental variables) when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/Total income	Housing debt/Total income	Non-housing debt/Total income	Expenditure on family equipment and daily necessities/Total income	Expenditure on clothing/Total income	Expenditure on education and entertainment/Total income	Expenditure on housing/Total income	Medical and fitness expenditure/Total income	Consumptive expenditure/Total incomes	Expenditure on food/Total income	Expenditure on communication and transportation/Total income
Basic financial literacy	0.243***	-0.150*	-0.375***	-0.005*	-0.001	0.017***	-0.016***	-0.019***	-0.131***	-0.062***	-0.007***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.175***	0.668***	0.178	0.023***	0.005**	0.032***	-0.007	-0.005	0.021	-0.037**	0.010***
(2) Low risks/returns	0.290***	0.369*	-0.124	0.003	0.002	0.036***	-0.019**	-0.022**	-0.066	-0.024	0.002
Age	0.006	0.054	0.099***	-0.002	-0.001*	0.003**	0.004***	0.006***	0.035***	0.014***	0.000
$Age^2/100$	0.002	-0.101**	-0.148***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.043***	-0.016***	-0.001**
Female respondent	0.039	0.246	-0.130	0.019***	0.011***	0.043***	0.009	0.022***	0.099***	0.011	0.006**
Family size	-0.091***	0.217***	0.125***	0.002	-0.000	0.021***	-0.010***	0.006*	-0.030**	-0.026***	0.000
With a degree	0.504***	0.817**	-0.973***	0.022*	0.004	0.061***	-0.044***	-0.033	-0.244***	-0.161***	-0.007
Ever attended school	0.222***	-0.323	-0.616***	0.000	0.002	0.044***	-0.030**	-0.043**	-0.181**	-0.082***	0.001
Employment status	-0.054	0.279*	-0.046	-0.007	-0.001	0.014*	-0.019**	-0.054***	-0.218***	-0.113***	-0.004
Health status	0.110*	0.034	-0.502***	0.007	0.001	0.009	-0.018*	-0.146***	-0.226***	-0.053**	-0.005
Hukou status	0.037	0.476***	0.415***	0.052***	0.009***	-0.011	0.052***	0.072***	0.407***	0.101***	0.033***
Marital status	0.232***	0.800***	-0.202	0.017**	0.002	0.010	-0.006	-0.001	-0.053	-0.022	0.003
Minority	-0.233**	0.779**	0.332	-0.015	0.004	0.025*	-0.003	-0.029	-0.033	-0.004	0.004
Old dependency	0.335***	-1.791***	-0.445*	-0.021*	-0.016***	-0.039***	0.023*	0.137***	0.254***	0.099***	-0.009
Young dependency	-0.042	1.046**	-0.046	0.039*	0.024***	0.144***	0.044**	0.020	0.513***	0.306***	0.025**
House ownership	0.114**			0.018***	0.000	-0.011	-0.031***	-0.004	-0.070	-0.049***	-0.003
Party membership	0.055	0.587***	0.174	0.015**	0.004**	0.022***	-0.015**	-0.001	-0.030	-0.043***	0.001
Intercept	-1.338***	-8.562***	-3.326***	0.099***	0.056***	-0.172***	0.079**	0.127**	1.044***	0.449***	0.123***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.21 Average marginal effects (ME) at both extensive margins and intensive margins of baseline models using basic financial literacy for full sample (without instrumental variables) when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/Total income	(2) Housing debt/Total income	(3) Non-housing debt/Total income	(4) Expenditure on family equipment and daily necessities/Total income	(5) Expenditure on clothing/Total income	(6) Expenditure on education and entertainment/Total income	(7) Expenditure on housing/Total income	(8) Medical and fitness expenditure/Total income
Panel A: Extensive margins								
Basic financial literacy	0.055***	-0.006	-0.026***	-0.006	-0.004	0.026***	-0.019***	-0.018***
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.040**	0.028***	0.013	0.026**	0.020*	0.050***	-0.008	-0.005
(2) Low risks/returns	0.066***	0.015	-0.008	0.004	0.007	0.056***	-0.022*	-0.021*
Panel B: Intensive margins								
Basic financial literacy	0.104***	-0.022	-0.059***	-0.002	0.000	0.007***	-0.008***	-0.008***
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.074**	0.100***	0.028	0.011**	0.003*	0.014***	-0.003	-0.002
(2) Low risks/returns	0.126***	0.054	-0.019	0.002	0.001	0.015***	-0.009*	-0.009*

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.22 Baseline models using advanced financial literacy for full sample (without instrumental variables) when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/Total income	Housing debt/Total income	Non-housing debt/Total income	Expenditure on family equipment and daily necessities/Total income	Expenditure on clothing/Total income	Expenditure on education and entertainment/Total income	Expenditure on housing/Total income	Medical and fitness expenditure/Total income	Consumptive expenditure/Total incomes	Expenditure on food/Total income	Expenditure on communication and transportation/Total income
Advanced financial literacy	0.193***	0.263***	-0.138**	-0.003	-0.001	0.018***	-0.008**	-0.013***	-0.072***	-0.047***	-0.003*
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.176***	0.411**	0.057	0.022***	0.005**	0.029***	-0.011	-0.007	-0.003	-0.040**	0.008**
(2) Low risks/returns	0.301***	0.167	-0.223*	0.002	0.002	0.034***	-0.022***	-0.024**	-0.088*	-0.028	-0.000
Age	0.006	0.057	0.101***	-0.002	-0.001*	0.003**	0.004***	0.006***	0.035***	0.014***	0.000
$Age^2/100$	0.002	-0.102**	-0.150***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.043***	-0.016***	-0.001**
Female respondent	0.053	0.258	-0.139	0.019***	0.011***	0.044***	0.009	0.021**	0.093***	0.008	0.006*
Family size	-0.093***	0.226***	0.131***	0.002	-0.000	0.021***	-0.010***	0.006*	-0.028**	-0.026***	0.000
With a degree	0.539***	0.481	-1.159***	0.021*	0.004	0.059***	-0.050***	-0.037*	-0.290***	-0.172***	-0.010*
Ever attended school	0.265***	-0.468*	-0.728***	-0.001	0.002	0.046***	-0.034***	-0.047**	-0.215***	-0.093***	-0.001
Employment status	-0.059	0.268*	-0.051	-0.007	-0.001	0.013*	-0.018**	-0.053***	-0.216***	-0.111***	-0.004
Health status	0.120**	0.019	-0.531***	0.007	0.001	0.010	-0.019**	-0.147***	-0.235***	-0.058**	-0.006
Hukou status	0.037	0.558***	0.444***	0.052***	0.009***	-0.010	0.053***	0.073***	0.414***	0.102***	0.033***
Marital status	0.257***	0.779***	-0.235*	0.017**	0.002	0.011	-0.008	-0.004	-0.069	-0.030	0.003
Minority	-0.259***	0.791**	0.372*	-0.015	0.004	0.024*	-0.001	-0.027	-0.021	0.002	0.005
Old dependency	0.349***	-1.785***	-0.450**	-0.021*	-0.016***	-0.038***	0.022*	0.136***	0.248***	0.094***	-0.009
Young dependency	-0.058	1.076**	-0.024	0.040*	0.024***	0.143***	0.045**	0.021	0.527***	0.311***	0.026***
House ownership	0.115**			0.018***	0.000	-0.011	-0.032***	-0.004	-0.072	-0.050***	-0.003
Party membership	0.058	0.555***	0.160	0.015**	0.004**	0.022***	-0.016**	-0.002	-0.035	-0.044***	0.001
Intercept	-1.408***	-8.427***	-3.191***	0.101***	0.056***	-0.176***	0.085**	0.134***	1.097***	0.471***	0.126***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.23 Average marginal effects (ME) at both the extensive margin and the intensive margin of baseline models using advanced financial literacy for full sample (without instrumental variables) when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/ Total income	(2) Housing debt/ Total income	(3) Non-housing debt/ Total income	(4) Expenditure on family equipment and daily necessities/ Total income	(5) Expenditure on clothing/ Total income	(6) Expenditure on education and entertainment/ Total income	(7) Expenditure on housing/ Total income	(8) Medical and fitness expenditure/ Total income
Panel A: Extensive margins								
Advanced financial literacy	0.044***	0.011**	-0.010*	-0.003	-0.004	0.028***	-0.010*	-0.013**
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.040**	0.017*	0.004	0.025**	0.020*	0.045***	-0.012	-0.007
(2) Low risks/returns	0.069***	0.007	-0.015	0.003	0.007	0.053***	-0.026**	-0.023*
Panel B: Intensive margins								
Advanced financial literacy	0.082***	0.039**	-0.022*	-0.001	0.000	0.008***	-0.004*	-0.006**
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.074**	0.061*	0.009	0.010**	0.003*	0.012***	-0.005	-0.003
(2) Low risks/returns	0.130***	0.024	-0.034	0.001	0.001	0.015***	-0.010**	-0.010*

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.24 Baseline models with basic and advanced financial literacy variables for full sample (without instrumental variables) when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Basic financial literacy	0.202***	-0.305***	-0.392***	-0.005	-0.001	0.012***	-0.016***	-0.017***	-0.008	-0.005	0.001
Advanced financial literacy	0.103***	0.391***	0.044	-0.001	-0.001	0.013***	-0.001	-0.005	0.040**	0.001	0.005***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	0.127**	0.488**	0.158	0.023***	0.005**	0.026***	-0.007	-0.003	0.131***	0.015	0.017***
(2) Low risks/returns	0.255***	0.234	-0.139	0.004	0.002	0.032***	-0.018**	-0.020*	0.009	0.007	0.006
Age	0.007	0.056	0.099***	-0.002	-0.001*	0.003***	0.004***	0.006***	0.002	0.001	-0.002***
$Age^2/100$	0.002	-0.101**	-0.148***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.004	-0.000	0.001*
Female respondent	0.045	0.276*	-0.128	0.019***	0.011***	0.044***	0.009	0.022**	0.134***	0.024*	0.008***
Family size	-0.090***	0.221***	0.126***	0.002	-0.000	0.021***	-0.010***	0.006*	0.089***	0.023***	0.009***
With a degree	0.454***	0.619*	-0.994***	0.023*	0.004	0.055***	-0.043***	-0.030	0.208***	0.034	0.024***
Ever attended school	0.206***	-0.381	-0.622***	0.000	0.002	0.042***	-0.030**	-0.042**	0.023	0.003	0.015***
Employment status	-0.057	0.270*	-0.047	-0.007	-0.001	0.013*	-0.019**	-0.054***	-0.074*	-0.054***	0.006*
Health status	0.111*	0.042	-0.501***	0.007	0.001	0.009	-0.018*	-0.146***	-0.079	0.007	0.003
Hukou status	0.053	0.537***	0.422***	0.052***	0.009***	-0.009	0.051***	0.071***	0.199***	0.011	0.019***
Marital status	0.235***	0.803***	-0.201	0.017**	0.002	0.010	-0.006	-0.002	0.260***	0.103***	0.024***
Minority	-0.239**	0.750**	0.328	-0.015	0.004	0.025*	-0.002	-0.029	-0.084	-0.026	0.000
Old dependency	0.343***	-1.769***	-0.442*	-0.021*	-0.016***	-0.038***	0.023*	0.137***	0.025	0.002	-0.024***
Young dependency	-0.039	1.066**	-0.044	0.039*	0.024***	0.144***	0.044**	0.019	-0.093	0.058	-0.015
House ownership	0.113**			0.018***	0.000	-0.011	-0.031***	-0.004	0.016	-0.012	0.002
Party membership	0.049	0.563***	0.170	0.015**	0.004**	0.021***	-0.015**	-0.001	0.090***	0.006	0.009***
Intercept	-1.332***	-8.536***	-3.323***	0.099***	0.056***	-0.171***	0.079**	0.127**	1.947***	0.810***	0.184***
Number of observations	14183	14158	14153	13910	13998	14075	13927	14105	13320	14050	13981

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.25 Average marginal effects (ME) at both extensive margins and intensive margins of baseline models using basic and advanced financial literacy variables for full sample (without instrumental variables) when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/ Total income	(2) Housing debt/ Total income	(3) Non-housing debt/ Total income	(4) Expenditure on family equipment and daily necessities/ Total income	(5) Expenditure on clothing/ Total income	(6) Expenditure on education and entertainment/ Total income	(7) Expenditure on housing/ Total income	(8) Medical and fitness expenditure/ Total income
Panel A: Extensive margins								
Basic financial literacy	0.046***	-0.013**	-0.027***	-0.006	-0.003	0.018**	-0.018***	-0.016***
Advanced financial literacy	0.023***	0.016***	0.003	-0.001	-0.002	0.021***	-0.001	-0.005
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.029*	0.021*	0.011	0.027**	0.021*	0.040***	-0.008	-0.003
(2) Low risks/returns	0.058***	0.009	-0.009	0.004	0.008	0.049***	-0.021*	-0.019
Panel B: Intensive margins								
Basic financial literacy	0.086***	-0.046**	-0.062***	-0.002	0.000	0.005**	-0.007***	-0.007***
Advanced financial literacy	0.044***	0.059***	0.007	0.000	0.000	0.006***	-0.001	-0.002
Risk attitude (base: no risks)								
(1) High/medium risks/returns	0.054*	0.073*	0.025	0.011**	0.003*	0.011***	-0.003	-0.001
(2) Low risks/returns	0.110***	0.034	-0.021	0.002	0.001	0.013***	-0.009*	-0.008

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.26 First-stage regression results when the dependent variables are ratios over income (with house ownership) when the dependent variables are ratios over income

Coefficients	Full sample		Household economic respondent aged 16-40		Household economic respondent aged 40-60		Household economic respondent aged 60 and over	
	(1) Basic financial literacy	(2) Advanced financial literacy	(3) Basic financial literacy	(4) Advanced financial literacy	(5) Basic financial literacy	(6) Advanced financial literacy	(7) Basic financial literacy	(8) Advanced financial literacy
Average basic financial literacy within each county	0.198***		0.139***		0.213***		0.216***	
Average advanced financial literacy within each		0.162***		0.115***		0.196***		0.151***
Risk attitude (the base category: no risks)								
(1) High/medium risks/returns	0.504***	0.626***	0.453***	0.545***	0.500***	0.624***	0.510***	0.654***
(2) Low risks/return	0.425***	0.489***	0.376***	0.441***	0.396***	0.431***	0.503***	0.600***
Age	-0.001	-0.005	-0.005	0.019	-0.079*	-0.011	-0.047	-0.054
$Age^2/100$	-0.004	-0.002	0.021	-0.009	0.072	-0.001	0.024	0.034
Female respondent	-0.008	-0.071**	0.005	-0.076	0.024	-0.056	-0.036	-0.068
Family size	-0.018*	-0.014	0.004	-0.035**	-0.034**	-0.030**	0.012	0.013
With a degree	0.678***	0.740***	1.039***	1.036***	0.620***	0.658***	0.432***	0.607***
Attended school	0.376***	0.289***	0.610***	0.515***	0.299***	0.204***	0.417***	0.344***
Employment status	0.024	0.061**	0.112**	0.031	0.069*	0.103***	-0.149**	-0.098*
Health status	0.075**	0.020	0.004	-0.088	0.130***	-0.003	0.024	0.055
Hukou status	-0.154***	-0.227***	-0.089	-0.201***	-0.119**	-0.197***	-0.250***	-0.214***
Marital status	0.161***	0.035	0.033	-0.026	0.168***	0.042	0.186***	0.039
Minority	-0.056	0.020	0.008	-0.074	-0.198	0.041	-0.001	0.018
Old dependency	-0.017	-0.110**	-0.415*	-0.139	0.018	0.074	0.034	-0.093
Young dependency	-0.105	-0.057	-0.247*	-0.338*	-0.090	-0.170	-0.308	0.051
House ownership	0.050*	0.040	-0.067	0.035	0.128***	0.037	0.041	0.061
Party membership	0.091**	0.088**	-0.065	0.037	0.098*	0.051	0.132**	0.141**
Intercept	-0.634***	-0.342**	-0.837	-0.868	1.325	0.063	1.184	1.109
Number of observations	14630	14630	3362	3362	6894	6894	4374	4374

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.27 First-stage regression results when the dependent variables are ratios over income (without house ownership) when the dependent variables are ratios over income

Coefficients	Full sample		Household economic respondent aged 16-40		Household economic respondent aged 40-60		Household economic respondent aged 60 and over	
	(1) Basic financial literacy	(2) Advanced financial literacy	(3) Basic financial literacy	(4) Advanced financial literacy	(5) Basic financial literacy	(6) Advanced financial literacy	(7) Basic financial literacy	(8) Advanced financial literacy
Average basic financial literacy within each county	0.198***		0.139***		0.213***		0.215***	
Average advanced financial literacy within each		0.162***		0.115***		0.196***		0.150***
Risk attitude (the base category: no risks)								
(1) High/medium risks/returns	0.506***	0.628***	0.450***	0.547***	0.506***	0.625***	0.512***	0.657***
(2) Low risks/return	0.427***	0.490***	0.373***	0.442***	0.401***	0.433***	0.504***	0.601***
Age	-0.000	-0.004	-0.003	0.018	-0.080*	-0.011	-0.045	-0.050
$Age^2/100$	-0.004	-0.002	0.018	-0.007	0.072	-0.001	0.022	0.032
Female respondent	-0.007	-0.071**	0.003	-0.075	0.025	-0.055	-0.035	-0.067
Family size	-0.016	-0.013	-0.001	-0.032*	-0.031*	-0.029**	0.013	0.015
With a degree	0.681***	0.742***	1.036***	1.038***	0.628***	0.660***	0.435***	0.611***
Attended school	0.376***	0.288***	0.610***	0.515***	0.297***	0.204***	0.417***	0.345***
Employment status	0.024	0.062**	0.112**	0.030	0.072**	0.104***	-0.149**	-0.097*
Health status	0.076**	0.021	-0.000	-0.086	0.133***	-0.002	0.025	0.056
Hukou status	-0.156***	-0.228***	-0.081	-0.206***	-0.116**	-0.196***	-0.250***	-0.214***
Marital status	0.164***	0.037	0.030	-0.024	0.182***	0.046	0.188***	0.042
Minority	-0.057	0.019	0.009	-0.074	-0.199	0.040	-0.004	0.015
Old dependency	-0.017	-0.110**	-0.416*	-0.139	0.020	0.075	0.031	-0.096
Young dependency	-0.107	-0.059	-0.247*	-0.337*	-0.097	-0.172	-0.308	0.051
Party membership	0.094**	0.090**	-0.064	0.037	0.103*	0.053	0.135**	0.144**
Intercept	-0.620***	-0.331*	-0.890	-0.840	1.398	0.083	1.129	1.027
Number of observations	14630	14630	3362	3362	6894	6894	4374	4374

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.28 IV models using basic financial literacy for full sample when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Basic financial literacy	0.653***	0.520	-1.469***	-0.009	-0.009**	0.003	-0.118***	-0.075***	-0.663***	-0.267***	-0.032***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.052	0.300	0.777***	0.025**	0.009***	0.039***	0.049***	0.026	0.315***	0.076***	0.024***
(2) Low risks/returns	0.101	0.063	0.377**	0.005	0.005*	0.042***	0.028**	0.004	0.179**	0.070**	0.013**
Age	0.009	0.058	0.090***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.032***	0.013***	0.000
$Age^2/100$	0.002	-0.102**	-0.145***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.042***	-0.016***	-0.001**
Female respondent	0.032	0.237	-0.110	0.019***	0.012***	0.043***	0.011	0.023***	0.108***	0.015	0.006**
Family size	-0.079***	0.235***	0.096***	0.002	-0.001	0.021***	-0.013***	0.004	-0.046***	-0.032***	-0.000
With a degree	0.183	0.288	-0.097	0.025	0.011**	0.072***	0.036*	0.011	0.174	-0.000	0.013
Ever attended school	0.047	-0.615**	-0.132	0.002	0.006	0.050***	0.014	-0.019	0.049	0.006	0.012**
Employment status	-0.065	0.261	-0.013	-0.007	-0.000	0.014**	-0.016*	-0.052***	-0.201***	-0.106***	-0.003
Health status	0.074	-0.028	-0.404***	0.008	0.002	0.010	-0.008	-0.141***	-0.178***	-0.034	-0.003
Hukou status	0.116*	0.605***	0.206	0.051***	0.008***	-0.013	0.032***	0.061***	0.303***	0.061**	0.028***
Marital status	0.166***	0.689***	-0.020	0.018**	0.004	0.012	0.011	0.008	0.032	0.011	0.008*
Minority	-0.197**	0.842**	0.232	-0.015	0.003	0.024*	-0.011	-0.034	-0.077	-0.022	0.002
Old dependency	0.342***	-1.782***	-0.466*	-0.021*	-0.016***	-0.040***	0.021	0.137***	0.243***	0.094***	-0.009
Young dependency	0.018	1.139***	-0.205	0.038*	0.022***	0.142***	0.028	0.011	0.429***	0.275***	0.021**
House ownership	0.096**			0.018***	0.001	-0.011	-0.028***	-0.002	-0.049	-0.041**	-0.002
Party membership	0.019	0.522***	0.278**	0.015**	0.004**	0.023***	-0.006	0.004	0.017	-0.025	0.003
Intercept	-1.105***	-8.190***	-3.900***	0.097***	0.052***	-0.179***	0.022	0.096*	0.750***	0.335***	0.108***
Number of observations	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.29 Average marginal effects (ME) at both extensive margins and intensive margins of IV models using basic financial literacy for full sample when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/ Total income	(2) Housing debt/ Total income	(3) Non-housing debt/ Total income	(4) Expenditure on family equipment and daily necessities/ Total income	(5) Expenditure on clothing/ Total income	(6) Expenditure on education and entertainment/ Total income	(7) Expenditure on housing/ Total income	(8) Medical and fitness expenditure/ Total income
Panel A: Extensive margins								
Basic financial literacy	0.139***	0.022	-0.112***	-0.010	-0.037*	0.005	-0.128***	-0.072**
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.011	0.013	0.060***	0.028*	0.038**	0.062***	0.053***	0.025
(2) Low risks/returns	0.021	0.003	0.027*	0.006	0.022	0.066***	0.031*	0.004
Panel B: Intensive margins								
Basic financial literacy	0.282***	0.079	-0.264***	-0.004	-0.005*	0.001	-0.056***	-0.033**
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.022	0.046	0.141***	0.011*	0.005**	0.017***	0.024***	0.011
(2) Low risks/returns	0.044	0.009	0.065*	0.002	0.003	0.018***	0.013*	0.002

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.30 IV models using advanced financial literacy for full sample when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Advanced financial literacy	0.772***	0.628	-1.336***	-0.005	-0.013**	0.002	-0.097***	-0.060**	-0.620***	-0.281***	-0.028***
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.214*	0.166	0.860***	0.023*	0.013***	0.040***	0.049***	0.025	0.367***	0.118***	0.025***
(2) Low risks/returns	-0.004	-0.024	0.407*	0.003	0.008**	0.043***	0.025*	0.001	0.201**	0.095***	0.013**
Age	0.012	0.061	0.088***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.030***	0.012***	0.000
$Age^2/100$	-0.000	-0.104***	-0.144***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.040***	-0.015***	-0.001**
Female respondent	0.081*	0.278*	-0.199*	0.019***	0.011***	0.043***	0.004	0.019**	0.066*	-0.003	0.004
Family size	-0.081***	0.233***	0.109***	0.002	-0.001	0.021***	-0.012***	0.005	-0.040***	-0.031***	-0.000
With a degree	0.068	0.180	-0.164	0.022	0.014**	0.073***	0.022	0.001	0.156	0.019	0.010
Ever attended school	0.075	-0.592*	-0.323*	-0.001	0.006*	0.051***	-0.005	-0.031	-0.034	-0.015	0.007
Employment status	-0.097*	0.244	0.030	-0.007	0.000	0.014**	-0.013	-0.050***	-0.179***	-0.095***	-0.002
Health status	0.105*	0.008	-0.495***	0.007	0.002	0.010	-0.016	-0.146***	-0.220***	-0.051**	-0.005
Hukou status	0.182***	0.650***	0.145	0.052***	0.006**	-0.014	0.030***	0.061***	0.276***	0.043	0.027***
Marital status	0.236***	0.766***	-0.190	0.017**	0.003	0.012	-0.005	-0.002	-0.050	-0.021	0.003
Minority	-0.278**	0.780**	0.410*	-0.015	0.004	0.024*	0.002	-0.026	-0.003	0.010	0.006
Old dependency	0.419***	-1.742***	-0.600**	-0.022*	-0.018***	-0.040***	0.011	0.130***	0.178**	0.065*	-0.012*
Young dependency	-0.010	1.103**	-0.127	0.039*	0.023***	0.141***	0.037	0.017	0.475***	0.291***	0.024**
House ownership	0.095*			0.018***	0.001	-0.010	-0.029***	-0.003	-0.055	-0.042**	-0.003
Party membership	0.004	0.519***	0.278**	0.015**	0.005**	0.023***	-0.008	0.003	0.017	-0.022	0.003
Intercept	-1.247***	-8.325***	-3.496***	0.101***	0.053***	-0.180***	0.061	0.121**	0.954***	0.408***	0.119***
Number of observations	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.31 Average marginal effects (ME) at both the extensive margin and the intensive margin of IV models using advanced financial literacy for full sample when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/ Total income	(2) Housing debt/ Total income	(3) Non-housing debt/ Total income	(4) Expenditure on family equipment and daily necessities/ Total income	(5) Expenditure on clothing/ Total income	(6) Expenditure on education and entertainment/ Total income	(7) Expenditure on housing/ Total income	(8) Medical and fitness expenditure/ Total income
Panel A: Extensive margins								
Advanced financial literacy	0.161***	0.027	-0.103***	-0.005	-0.051*	0.003	-0.108***	-0.058*
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.045	0.007	0.068***	0.027	0.052**	0.062**	0.054**	0.024
(2) Low risks/returns	-0.001	-0.001	0.029	0.004	0.032*	0.067***	0.028	0.001
Panel B: Intensive margins								
Advanced financial literacy	0.332***	0.094	-0.236***	-0.002	-0.007*	0.001	-0.046***	-0.026*
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.091	0.025	0.154***	0.011	0.007**	0.017**	0.024**	0.011
(2) Low risks/returns	-0.002	-0.004	0.069	0.001	0.004*	0.018***	0.012	0.001

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.32 IV models with basic and advanced financial literacy variables for full sample when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Basic financial literacy	0.404**	0.221	-1.563***	-0.013	-0.003	0.001	-0.136***	-0.087**	-0.652***	-0.217***	-0.036***
Advanced financial literacy	0.422*	0.451	0.051	0.007	-0.010	-0.000	0.021	0.015	-0.060	-0.094	0.003
Risk attitude (the base category: no risks)											
(1) High/medium risks/returns	-0.200*	0.159	0.795***	0.022*	0.013***	0.041***	0.045***	0.022	0.350***	0.112***	0.024***
(2) Low risks/returns	-0.007	-0.038	0.393*	0.003	0.008**	0.044***	0.026*	0.002	0.206**	0.097***	0.013**
Age	0.011	0.060	0.090***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.031***	0.012***	0.000
$Age^2/100$	0.000	-0.102**	-0.144***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.042***	-0.015***	-0.001**
Female respondent	0.057	0.271*	-0.106	0.020***	0.011***	0.043***	0.012*	0.024***	0.105**	0.009	0.006**
Family size	-0.077***	0.237***	0.094***	0.002	-0.001	0.021***	-0.013***	0.004	-0.047***	-0.033***	-0.000
With a degree	0.036	0.154	-0.062	0.023	0.014**	0.074***	0.034	0.008	0.214	0.037	0.013
Ever attended school	0.015	-0.632**	-0.107	0.001	0.006*	0.051***	0.015	-0.019	0.064	0.016	0.012**
Employment status	-0.083*	0.252	-0.011	-0.007	0.000	0.014**	-0.016**	-0.053***	-0.197***	-0.102***	-0.003
Health status	0.085	-0.009	-0.396***	0.008	0.002	0.011	-0.007	-0.141***	-0.177***	-0.036	-0.003
Hukou status	0.172***	0.654***	0.200	0.052***	0.006**	-0.014	0.033***	0.063***	0.290***	0.048*	0.028***
Marital status	0.191***	0.714***	-0.007	0.018**	0.003	0.012	0.013	0.009	0.033	0.007	0.008*
Minority	-0.231**	0.797**	0.219	-0.016	0.004	0.024*	-0.013	-0.036*	-0.074	-0.014	0.002
Old dependency	0.385***	-1.754***	-0.466*	-0.020*	-0.017***	-0.040***	0.023	0.138***	0.236***	0.084**	-0.009
Young dependency	0.017	1.144***	-0.214	0.038*	0.022***	0.141***	0.027	0.011	0.425***	0.274***	0.021**
House ownership	0.093*			0.018***	0.001	-0.010	-0.028***	-0.002	-0.048	-0.040**	-0.002
Party membership	0.002	0.506**	0.280**	0.015**	0.005**	0.023***	-0.007	0.003	0.022	-0.020	0.003
Intercept	-1.129***	-8.227***	-3.935***	0.097***	0.052***	-0.181***	0.018	0.094*	0.741***	0.337***	0.107***
Number of observations	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630	14630

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.33 Average marginal effects (ME) at both extensive margins and intensive margins of IV models using basic and advanced financial literacy variables for full sample when the dependent variables are ratios over income

Average marginal effects	(1) Cash and deposits/ Total income	(2) Housing debt/ Total income	(3) Non-housing debt/ Total income	(4) Expenditure on family equipment and daily necessities/ Total income	(5) Expenditure on clothing/ Total income	(6) Expenditure on education and entertainment/ Total income	(7) Expenditure on housing/ Total income	(8) Medical and fitness expenditure/ Total income
Panel A: Extensive margins								
Basic financial literacy	0.086*	0.009	-0.120***	-0.015	-0.013	0.002	-0.146***	-0.083*
Advanced financial literacy	0.089	0.019	0.004	0.008	-0.040	-0.001	0.023	0.015
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.042	0.007	0.061***	0.026	0.052**	0.063**	0.048**	0.021
(2) Low risks/returns	-0.001	-0.002	0.028	0.004	0.033*	0.068***	0.028	0.001
Panel B: Intensive margins								
Basic financial literacy	0.174*	0.033	-0.284***	-0.006	-0.002	0.000	-0.065***	-0.038*
Advanced financial literacy	0.182	0.068	0.009	0.003	-0.005	0.000	0.010	0.007
Risk attitude (base: no risks)								
(1) High/medium risks/returns	-0.086	0.024	0.146***	0.010	0.007**	0.017**	0.022**	0.010
(2) Low risks/returns	-0.003	-0.006	0.069	0.001	0.004*	0.019***	0.012	0.001

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardised.

Appendix 4.34 The comparison of the results of age and age squared divided by 100 for full sample with the dependent variables in the logarithmic form

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	The log of the amount of cash and deposits	The log of housing debt	The log of non-housing debt	The log of expenditure on family equipment and daily necessities	The log of expenditure on clothing	The log of expenditure on education and entertainment	The log of expenditure on housing	The log of medical and fitness expenditure	The log of consumptive expenditure	The log of expenditure on food	The log of expenditure on communication and transportation
Panel A: Baseline models with basic financial literacy											
Age	-0.072***	0.235	0.415***	-0.032***	-0.026**	-0.031	-0.005	-0.018	-0.009***	-0.003	0.006
$Age^2/100$	0.087***	-0.448***	-0.714***	0.021***	0.003	-0.002	0.005	0.039**	0.007**	0.006	-0.019**
Panel B: Baseline models with advanced financial literacy											
Age	-0.070**	0.247	0.421***	-0.031***	-0.026**	-0.028	-0.005	-0.017	-0.009***	-0.003	0.007
$Age^2/100$	0.084***	-0.450***	-0.713***	0.021***	0.003	-0.003	0.005	0.038**	0.007**	0.006	-0.019**
Panel C: Baseline models with basic and advanced financial literacy											
Age	0.359**	1.568**	0.775	0.234***	0.266***	0.583***	-0.057	0.030	0.099***	0.047**	0.228***
$Age^2/100$	0.517***	0.978	-0.760	0.046	0.151**	0.534***	-0.026	0.018	0.013	-0.000	0.094**
Panel D: IV models with basic financial literacy											
Age	-0.070**	0.239	0.398***	-0.031***	-0.025**	-0.030	-0.006	-0.017	-0.009**	-0.002	0.007
$Age^2/100$	0.091***	-0.440***	-0.738***	0.023***	0.005	0.002	0.004	0.039***	0.009**	0.007	-0.017*
Panel E: IV models with advanced financial literacy											
Age	-0.058*	0.247	0.373***	-0.028***	-0.022*	-0.024	-0.005	-0.016	-0.007*	-0.001	0.015
$Age^2/100$	0.086***	-0.450***	-0.717***	0.021**	0.003	-0.002	0.005	0.039**	0.008**	0.006	-0.019**
Panel F: IV models with basic and advanced financial literacy											
Age	-0.061**	0.240	0.395***	-0.029***	-0.024**	-0.025	-0.003	-0.016	-0.007*	-0.001	0.009
$Age^2/100$	0.088***	-0.441***	-0.737***	0.023**	0.005	0.003	0.003	0.039**	0.008**	0.007	-0.017*

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardized.

Appendix 4.35 The comparison of the results of age and age squared divided by 100 for full sample when the dependent variables are ratios over income

	Tobit								GLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Coefficients	Cash and deposits/ Total income	Housing debt/ Total income	Non-housing debt/ Total income	Expenditure on family equipment and daily necessities/ Total income	Expenditure on clothing/ Total income	Expenditure on education and entertainment/ Total income	Expenditure on housing/ Total income	Medical and fitness expenditure/ Total income	Consumptive expenditure/ Total incomes	Expenditure on food/ Total income	Expenditure on communication and transportation/ Total income
Panel A: Baseline models with basic financial literacy											
Age	0.006	0.054	0.099***	-0.002	-0.001*	0.003**	0.004***	0.006***	0.035***	0.014***	0.000
$Age^2/100$	0.002	-0.101**	-0.148***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.043***	-0.016***	-0.001**
Panel B: Baseline models with advanced financial literacy											
Age	0.006	0.057	0.101***	-0.002	-0.001*	0.003**	0.004***	0.006***	0.035***	0.014***	0.000
$Age^2/100$	0.002	-0.102**	-0.150***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.043***	-0.016***	-0.001**
Panel C: Baseline models with basic and advanced financial literacy											
Age	0.007	0.056	0.099***	-0.002	-0.001*	0.003***	0.004***	0.006***	0.002	0.001	-0.002***
$Age^2/100$	0.002	-0.101**	-0.148***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.004	-0.000	0.001*
Panel D: IV models with basic financial literacy											
Age	0.009	0.058	0.090***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.032***	0.013***	0.000
$Age^2/100$	0.002	-0.102**	-0.145***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.042***	-0.016***	-0.001**
Panel E: IV models with advanced financial literacy											
Age	0.012	0.061	0.088***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.030***	0.012***	0.000
$Age^2/100$	-0.000	-0.104***	-0.144***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.040***	-0.015***	-0.001**
Panel F: IV models with basic and advanced financial literacy											
Age	0.011	0.060	0.090***	-0.002	-0.001**	0.003**	0.004**	0.005**	0.031***	0.012***	0.000
$Age^2/100$	0.000	-0.102**	-0.144***	0.000	-0.000	-0.005***	-0.005***	-0.005**	-0.042***	-0.015***	-0.001**

* p<0.10 ** p<0.05 *** p<0.01

Both basic and advanced financial literacy variables are standardized.

Chapter 5

Conclusion

5.1 Summary of Findings

The empirical results of Chapter 2 suggest that income expectations play a different role in determining household financial and consumption decisions. The households are categorised into three distinct categories: the optimistic group that anticipates a higher household income in five years, the neutral group that expects no change in their future household income in five years, and the pessimistic group that expects a lower household income in five years. Neutral urban households have a higher probability of having positive consumption (total, durable and nondurable), financial assets and debt, and have higher amounts of consumption (total, durable and nondurable) conditional on having positive consumption than optimistic households. Pessimistic households on average have a higher probability of having positive consumption (total, durable and nondurable) and debt, and have higher amounts of consumption (total, durable and nondurable) and debt conditional on being uncensored than optimistic households (the reference group).

For rural households, correlations are found between income expectations and household assets. In detail, pessimistic households in rural areas have a higher likelihood of having household financial assets and have higher amounts of financial assets conditional on having any financial assets. Lastly, for migrant households, neutral households have a lower probability of having any financial assets and then hold lower financial assets with respect to annual household income compared with urban households (the reference group). Besides, pessimistic migrant households are less likely to have positive consumption (both durable and nondurable) and have smaller consumption-to-income ratios, indicating that a smaller proportion of annual household income is spent in consumption (durable and nondurable).

The empirical results of Chapter 3 with a difference-in-difference estimation methodology suggest that housing demolitions (the treatment) significantly increase the likelihood of positive holdings and the

amounts conditional on being uncensored in education debt (in the logarithmic form), housing consumption (e.g., bills and property management fees) as ratios to income, consumption on housing maintenance as ratio to income, and travelling consumption as ratios to income. Interestingly the causal effects of housing demolitions are not significant for all financial assets, other debt categories and other consumption categories. It is noteworthy to mention the dual attributes of housing assets – the wealth attribute and the commodity attribute (Juster *et al.*, 2006). Therefore, housing demolitions potentially bring affected households both wealth shocks and consumption shocks, leading to impacts different from wealth shocks discussed in the literature review section of Chapter 3.

Empirical results of Chapter 4 are complicated with two types of estimation results with the first being baseline estimation results without instrumental variables and the second being IV estimation results with instrumental variables. There are two types of estimation results, the baseline results without instrumental variables and the IV results. Starting with the baseline results, for liquid financial assets, both basic and advanced financial literacy have positive relationships with the probability of holding positive liquid assets and the amounts of liquid assets households hold measured as ratios to household income, conditional on being uncensored. This finding is consistent with the existing evidence supporting the positive relationship between financial literacy and household savings (Heckman and Hanna, 2015; Klapper *et al.*, 2013; Cole *et al.*, 2011; Morgan and Trinh, 2019; Morgan and Long, 2020; Kim and Yuh, 2018), as mentioned above.

The empirical results of the baseline housing debt models indicate that there is a negative relationship between basic financial literacy and household housing debt and a positive relationship between advanced financial literacy and household housing debt, both in the probability of being indebted (the extensive margin) and the amounts in the logarithmic form or the ratio form over income conditional on being indebted (the intensive margin). From the empirical results of the baseline non-housing debt models, basic (advanced) financial literacy is negatively related to the likelihood of being indebted and

the amounts in the logarithmic form or the ratio form over income conditional on being indebted to models with only basic (advanced) financial literacy.

From the estimation results of baseline models using household consumption as ratios to total household income with only basic (advanced) financial literacy, basic (advanced) financial literacy is positively related to household consumption on education and entertainment and negatively related to household consumption on housing, medical treatment and fitness, food, and communication and transportation, and total household consumption measured as the consumption-to-income ratios. After including both basic and advanced financial literacy variables, the baseline results suggest advanced financial literacy is positively related to household consumption on education and entertainment as ratios to income, but negatively related to household consumption on housing, and medical treatment and fitness. Advanced financial literacy is positively related to household consumption on education and entertainment, total consumption, and consumption on communication and transportation.

Turn to the estimation results of IV models, for household liquid assets, when only basic (advanced) financial literacy is included in the model, a positive causal relationship is found between basic or advanced financial literacy and the probability of holding positive liquid assets, and between basic or advanced financial literacy and the amounts of household liquid assets measured as ratios to household income, conditional on having positive cash and deposits. The findings are in line with the results of models without instrumental variables, but there is a huge difference in the size of coefficients between liquid asset models with instruments and liquid asset models without instruments. Remarkably, in models with both financial literacy variables, the coefficients of basic financial literacy are not significant after employing instrumental variables to solve the potential endogeneity problem.

From the empirical results of the housing debt models with instrumental variables, both basic and advanced financial literacy do not have any impacts on household housing debt. In China, financial agencies (e.g. commercial banks) as the originators of housing mortgage loans are responsible for household housing debt (e.g. identifying and measuring risks) (LI, 2005). A possible explanation for the result is that the participation of professional institutions may weaken the role of basic and advanced financial literacy. As for the non-housing debt models with instrumental variables, when only basic (advanced) financial literacy is included, households with higher basic (advanced) financial literacy scores have a lower probability of being indebted to non-housing debt and have higher amounts of non-housing debt conditional on being indebted. When both basic and advanced financial literacy are included in the non-housing debt, basic financial literacy is negatively related to household non-housing debt but the results indicate advanced financial literacy has no impact on household non-housing debt.

The empirical results of the consumption models with instrumental variables, the empirical results suggest that there is a positive causal relationship between basic financial literacy and household consumption in the logarithmic form regarding family equipment and daily necessities, clothing, education and entertainment, food, communication and transportation, and total consumption. Comparatively, advanced financial literacy has a positive impact on household consumption on family equipment and daily necessities, food consumption, consumption on communication and transportation, and total consumption. This chapter is one among the first to introduce both basic and advanced financial literacy into household consumption. There is not much existing evidence to compare with. However, Dinkova, Kalwij and Alessie (2021) posit a positive relationship between (basic) financial literacy and nondurable consumption (e.g. food consumption), which is in line with the finding of this chapter with and without instrumental variables.

5.2 Implications, Limitations and Future Research

The empirical evidence obtained from Chapter 2 shows that income expectations have heterogeneous effects on different outcome variables for different groups (urban, rural and migrant households). Rural households can rely on land to produce goods for their own consumption, while urban households have social benefits different from rural households, as mentioned in Chapter 2. The sensitivity of household financial and consumption decisions to anticipated financial changes is different for different people. In Chapter 3, housing demolitions do not have a causal effect on household composition of financial assets, but influence household education debt and household consumption closely related to housing demolitions and housing relocation (e.g., housing, housing maintenance and travelling). This suggests that housing demolitions led by local authorities bring higher debt burdens and higher consumption relative to household income in categories closely related to housing. From the view of fairness and justice, the market value of demolished houses should not be the exclusive dimension to ensure that the affected households will not be worse off after housing demolitions.

In Chapter 4, from the results, basic and advanced financial literacy have different roles in determining household liquid assets, household debt, and household consumption. This chapter provides two different aspects to look at the changes of outcomes, the absolute changes in the logarithmic form, which can also be interpreted using percentage changes, and the relative changes with respect to total household income. The conclusions from these two perspectives provide different implications. For example, for clothing consumption, basic and financial literacy are positively related to clothing consumption in the logarithmic term, but shown to have no impact on the proportion of household income spent in clothing consumption. Therefore, as policy makers, even if the target (e.g., income expectation and external shocks) has been determined, they should be aware that the impacts of the target are different for different people under different circumstances.

The main limitations of Chapter 2 originate from the estimation of household permanent income and the use of cross-sectional data. As discussed in the Section 2.4.1, due to the limitations of data, this chapter adopts different strategies to estimate the household type 1 permanent income. For urban households, household permanent income is the sum of the estimated permanent income of all household members. However, for rural and migrant households, without information on individual income, household permanent income is directly estimated. Besides, the type 2 household permanent income is the mean of the history data of household income. There is no history data on household income for migrant households. Therefore, for migrant households, this chapter only use the type 1 household permanent income.

The responsible institutions and the questionnaires of the CHIP surveys are not consistent across waves, and the income expectation question is exclusively included in the questionnaire of the wave 2002. Therefore, this chapter chooses to use cross-sectional data of the CHIP 2002. Due to the use of cross-sectional data collected at a single time point, it is difficult to explore a causal relationship because all results are kind of relationships between income expectations and outcomes in a snapshot at a single time point. It is hard to identify the impacts of income expectations without changes over time. Besides, it is hard to control for unobserved time-invariant characteristics that determine household financial and consumption outcomes, potentially leading to biases.

In Chapter 3, the main drawbacks arise from the deficiencies of data used in Chapter 3. First, the selected time interval is four years. That is, this chapter explores the medium-term impacts of housing demolitions on household financial and consumption decisions with an interval of four years. The passive choice of four years comes from the limitations of the CHFS data. When more suitable data are available, it is meaningful to explore the impacts of housing demolitions in the short-term, medium term and long-term respectively. Second, the survey questions are not consistent across different waves, which leads to biases of this empirical studies.

In Chapter 4, the main limitations stem from the limitations of data and the identification method. First, based on the first five waves from 2010 to 2018, this chapter can only construct unbalanced panel data, meaning that not all observations attend all waves of surveying. Therefore, only consumption levels are used. To avoid losing many observations, this chapter does not construct consumption growth variables, even if the two main studies inspiring this chapter explore both consumption levels and consumption growth. Indeed, because survey questions regarding financial literacy are not contained in all waves, both Chapter 2 and Chapter 3 make a strict assumption of constant financial literacy. The relaxation of this strict assumption is important when additional data are available.

Second, the validity of the instrumental variables is still up for further discussion. The IV results violate the mainstream discovery of financial literacy that basic financial literacy plays an important role in household holdings of riskless and risky assets, as discussed in the section of baseline estimation results. This violation may lead to the criticism of model specifications (e.g., the inclusion of house prices), the concern of the validity of using average financial literacy as the instrument to solve endogenous problems, the discussion of "competing explanations" (Ray, 2003) that basic and advanced financial literacy are just "alternative causes" and so on. However, the use of the county-level average financial literacy is the only plausible instrumental approach to solve the endogeneity in the models with two endogenous financial literacy variables in Chapter 4.

This thesis explores the role of income expectations, housing demolitions, and financial literacy on household financial and consumption decisions. The information of income expectations comes from a survey question asking households to provide their own predictions about the future household income in five years. The information on housing demolitions is derived from the reported experience of housing demolitions with a time interval of four years. Both basic and advanced financial literacy are obtained from respondents' answers to financial literacy questions predefined in different datasets.

Obviously, the quality of data directly determines the quality of empirical studies in household finance. The development of datasets may lead to more reliable and robust empirical studies.

All three chapters in this thesis take one step forward based on previous research. Chapter 2 introduces permanent income to explore the impacts of income expectations on household financial and consumption decisions. Chapter 3 uses a novel method to create balanced panel data to overcome the inconsistency of survey questions regarding housing demolitions over different waves, and uses a difference-in-difference methodology to study the impacts of housing demolitions. Chapter 4 introduces advanced financial literacy into asset and debt models, and attempts to build a relationship between financial literacy and household consumption considering both basic and advanced financial literacy. All chapters provide new empirical evidence for developing countries. Future research can take one more step forward, along with overcoming the limitations of this thesis.

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