

The Dual Effects of Housing on Portfolio Choices: Evidence from Urban China

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Finance literature regarding the role of housing on portfolio choices is controversial. Our study reconciles both positive and negative effects of housing on portfolio decisions in the context of China. Employing the China Household Finance Survey (CHFS) data, we find dual effects of housing on portfolio choices simultaneously. House value appreciation imposes positive effects on households' stock investment, whereas house-to-wealth ratio has adverse effects on households' investment on risky financial assets. Housing itself creates trade-off effects on households' portfolio choices.

Key Words: Housing; Portfolio choice; Dual effects; Chinese housing reform.

JEL Classification Numbers: D91, E21, G11, R20, R22.

1. INTRODUCTION

Housing is a dominant component of wealth for typical households in many countries. Although it is widely recognized as a key element in determining household financial asset allocation, the extant literature regarding the role of housing in the portfolio choice shows inconsistent findings. Both positive and negative impacts of housing on portfolio arrangements are well documented.

The arguments for the positive effects of housing on household portfolios emphasize that, in a given period, when real house price appreciation accel-

erated, home ownership could have an independent effect on the ability of households to accumulate wealth (Turner and Luea, 2009). The wealth improvement from housing capital gain enables the households to be less risk averse and engage in riskier investment in equity products (Cardak and Wilkins, 2009; Chetty and Szeidl, 2015). Even though households show only a “book gain” through house price appreciation, the perceived wealth may also stimulate households’ investment in riskier portfolios, creating the “wealth effect” on their portfolio choices (Shum and Faig, 2006; Campbell and Cocco, 2007; Fougere and Poulhes, 2012; Wachter and Yogo, 2010).

The positive influences of housing on riskier portfolios are also supported from the perspective of risk hedging. Sinai and Souleles (2005) argue that homeowners with a long expected tenure are perfectly hedged against fluctuations in rents, the dominant risk for households with longer horizons. Wu and Pandey (2012) note that residential real estate also provides a modest hedge against inflation. The hedging functions of housing induce the household to endure greater risk and make riskier financial investments. In addition, as housing returns are not correlated with returns on other financial assets, investing in equities may act as a useful diversification tool in a household’s portfolio (Goetzmann and Kumar, 2008).

On the other hand, the negative effects of housing on household portfolios are also widely reported. Housing as the major component of wealth is indivisible and relatively illiquid. High equity homeowners have a less diversified portfolio and thus are exposed to more risk (Meyer and Wieand, 1996). Owning a house introduces asset price risk and a higher house-to-wealth ratio not only subjects owners to a larger house price fluctuation risk, but also leads to higher liquidity risk (Grossman and Laroque, 1990; Campbell and Cocco, 2003; Cocco, 2004; Fratantoni 2001). Therefore, house owning brings additional risk exposure to households (so-called background risk) and reduces the demand for risky financial assets, generating the “crowd-out effect” (Flavin and Yamashita, 2002).

From the perspective of the house’s consumption role, house holding also reduces equity holding. To fulfil housing demand, investors are prone to reducing shares. Benjamin et al. (2004) analyse the phenomenon of the relatively small holding of financial assets and the large holding of housing wealth. They find that a high concentration of household wealth in housing is due to households’ higher marginal propensity to consume from housing than from financial assets. Cocco (2004) finds that younger and poorer investors have limited financial wealth to invest in stocks due to investment in housing.

The negative correlation between stockholding and housing wealth is evidenced in many developed countries. Using U.S. data, Yamashita (2003) shows that households with a high house-to-wealth ratio hold a lower proportion of stocks. In the Netherlands, Hochguertel and van Soest (2001)

report that higher house prices reduce the probability of holding financial assets. In Finland, Saarimaa (2008) proposes that owner-occupied housing has an adverse effect on household stockholding. In France, Arrondel and Savignac (2009) find that housing wealth crowds out stock market participation.

Currently, studies on the effects of housing on household portfolio choices have been undertaken in developed countries, little attention has been paid to developing countries, such as China, a rapid developing country that provides a unique background for studying the effects of housing on portfolios. In its transition to a market economy, China has undergone urban housing privatization reforms, in which access to housing has been decoupled from state employment, and property rights have been transferred from the state to individuals (Iyer et al., 2009). The shift in home ownership resulting from the housing reform has entirely changed the portfolio of family assets and transformed China into a country with the highest rate of home ownership in the world (Wang, 2012).

In recent years, the housing price in China has experienced unprecedented growth, yielding housing wealth windfalls for homeowners. The history of the real estate market in China is rather short. Unlike houses' volatile prices in the U.S. and U.K., where houses are regarded as risky assets (Campbell and Cocco, 2007), the continual one-way rise in house prices and rents in China has formed a strong belief that purchasing houses is one of the safest forms of investment; the rate of return on buying a house exceeds most other types of investment (Li and Wu, 2014). Meanwhile, the lack of property tax in China attracts households to save more for future possible housing investments.

Given the ambiguity of the effects of housing on household financial asset allocation in developed countries and special features of the housing system in China, it is both interesting and necessary to investigate the impacts of housing on household portfolios in the context of China. This paper adds to the literature by examining the effects of housing on the portfolio decisions of Chinese urban households, using China Household Finance Survey (CHFS) data in 2011.

Our study contributes to the literature in the following several ways. First, different from previous studies that emphasize either positive or negative impacts of housing on portfolio choices, we find significant dual effects of housing on portfolio choices. House value appreciation has positive effects on households' investment on equity portfolios, whereas the house-to-wealth ratio imposes negative effects on households' stock investments. We argue that housing itself creates trade-off forces in household portfolio choices.

Secondly, our analysis is conducted in a different setting — China, where housing price has increased dramatically in the past decades. During the

late 1980s and the 1990s, households in most Chinese cities were offered the chance to purchase the apartments that they rented from the state, thereby untying access to housing from working in the state sector and giving urban residents a chance to become private homeowners. These reforms were enacted in at least 50 cities, potentially affecting more than 90 million people in China. In this sense, it is the largest urban housing reform in the world. Moreover, the Chinese have a tradition of valuing home ownership and the house is one of the most important “status goods” in China. For young men, owning a house is usually a prerequisite for marriage (Wei and Zhang, 2011). Therefore, a study on the impacts of housing on household portfolio choices in China not only has its own interests, but also sheds some light on other countries that experience similar housing reforms (e.g., Vietnam and the former U.S.S.R.).

Finally, since the analysis of the effects of house value appreciation on portfolio decisions is complicated by possible endogeneity issues resulting from either reverse causality between housing and portfolio decisions, or omitted variables affecting both the housing market and equity market, we follow Chetty and Szeidl (2015) and consider house purchasing price as an instrumental variable (IV) for house price appreciation to address the endogeneity issues. We also conduct robustness checks for the dual effects of housing by not only adjusting house value appreciation through CPI, but also employing constructed house value based on community unit housing price. In addition, we achieve identification in the specific context of housing market in China by running the regression on subsample households, in which their acquisition of houses is beyond the family control and independent of the family’s financial arrangements, therefore the related housing variables are reasonably to be considered exogenous.

The remainder of the paper is organized as follows. Section 2 introduces China’s housing reform, and sketches recent housing market and financial markets in China. Section 3 summarizes the data, variables and models. Section 4 presents results of dual effects of housing on portfolio choices with robustness checks. Section 5 concludes.

2. CHINA’S HOUSING MARKET AND FINANCIAL MARKETS

Prior to the economic reforms initiated in 1978, housing in urban China was provided to households based on their work units. In 1993, approximately 40 percent of urban households in China were residing in state-owned housing (Wang, 2012). Due to serious problems in the state-provision of housing, including shortages, poor management, and corruption in the distribution in the 1990s, a profound housing reform was launched by allowing state employers to sell public housing units to sitting tenants in urban

areas throughout the country. Individuals in state-owned housing were given the opportunity to buy their current homes at a deeply subsidized price.

The housing reform began formally in 1994 and was implemented in at least 50 cities, potentially affecting more than 90 million people. The guiding rule for the sale price of state provided housing was that, the price of a new apartment should be equal or less than three times the average household annual income in a city. If it was an older house, the price should be adjusted according to a depreciation formula that fully depreciated the house value over 75 years. In addition, there were different concessions (the price reduction) implemented. One widely employed concession rule was based on job tenure. The longer an employee worked at the work unit, the greater probability for he/she to obtain a house, and the higher the concession of the housing prices. Furthermore, work units had discretion to adjust price according to location and quality of the houses or specific circumstances of the work units. Data from the Chinese Household Income Project in 1995 indicate that the average difference between the market value and the price charged by the work units was ¥24,462, which is more than two times the average annual wages of a household (Iyer et al., 2009).

As a consequence, most urban households obtained their home ownership outright by paying less than 15% of the market value for their houses (Wang, 2011). Households without cash to purchase their homes had the incentive to take loans because they would gain the difference between the market value and the government sale price. The housing reform transformed China into a country with one of the highest rates of home ownership in the world. The housing privation reform ended with the cancellation of house purchase from public work units and commercial banks started to offer mortgage loan services for housing buyers in 1998. Since then, housing has become commercialized and privatized in China.

Because of the strong driving effects of the real estate industry on the steel, glass, cement, chemical and many other industries, the Chinese government has been supporting the housing market by means of monetary and fiscal stimuli. Especially the central government stimulated four trillion RMB in investment in the aftermath of global financial crisis in 2008, part of which went into real estate markets. As a result of excessive housing demand, the national average of housing prices has experienced one-way increases, with the trend speeding up after 2003. In the period 2003—2009, overall property prices in 35 cities, as reported by the National Development and Reform Commission of China, approximately doubled.

Several factors have contributed to the strong housing demand. First, the Chinese have a tradition of valuing home ownership and the house is one of the most important “status goods” in China. For young men, owning a house is usually a necessary condition for marriage. According to

Gan (2014), the main driving factor that makes China a country with the highest home ownership rate is the group people aged 25—34 years. Second, after the continual housing price increases in the past decade, people have gradually formed the belief that purchasing a house is one of the safest forms of investment (Li and Wu, 2014). In the absence of property taxes in China, the cost of holding multiple houses is ignorable. Homeowners are not only able to reap capital gains, but also to gain the rising rental incomes. Therefore, the dramatic increases in housing prices has turned house buying into a speculative activity. In addition, the lack of investment channels and rapid urbanization process may also have contributed to the recent property boom in China.

In contrast to the booming real estate market, the financial market experienced large fluctuations in the same period. Figure 1 shows the comparison of the Shanghai Stock Exchange Composite Index (stocks) and the average price of commodity house sales from the National Bureau of Statistics of China. It can be seen that the housing price index indicates a stable increasing trend in the past decade, whereas the equity market experienced a roller coaster trajectory. Although China has achieved roughly two digit average GDP annual growth for three decades, the stock market has performed at the lowest level among the world's major financial markets. It is clear that during this period the return on housing investment outperformed that from equity products.

FIG. 1. Comparison of Stock and Housing Markets in China (2003-2011).



Notes: Data Source for Shanghai Composite Index is obtained from WIND database; Commodity House Average Sales Price series is obtained from National Bureau of Statistics of China.

3. DATA AND MODEL ESTIMATION

3.1. Data and Variables

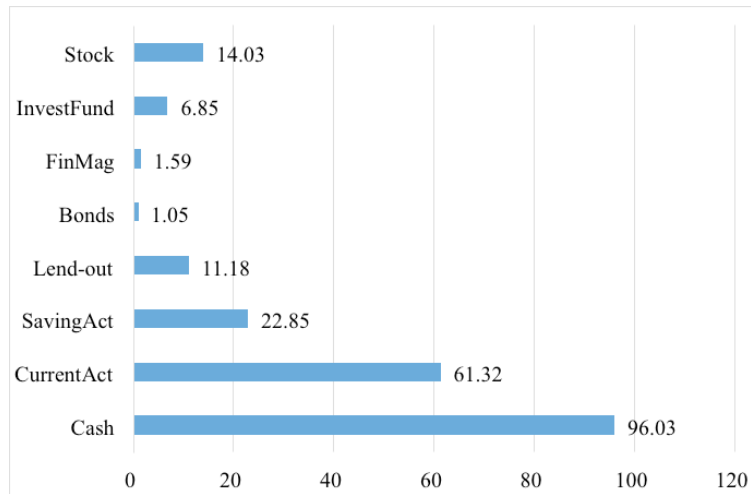
Our empirical analysis is based on the China Household Finance Survey (CHFS) data in 2011, which is modelled on the Federal Reserve's Survey of Consumer Finances in U.S. The CHFS is conducted by Southwestern University of Finance and Economics and covers 8,438 households, consisting of 29,463 individuals in 80 counties in China, excluding Tibet, Xinjiang, Inner Mongolia, Hong Kong and Macau. The survey uses method of three stages Probability Proportionate to Size Sampling (PPS) to ensure covering enough developed areas (coastal zones), urban households, and rich families. This survey is the first nationally representative survey in China on household finance (Gan et al., 2013).

The CHFS is composed of four parts of information for each household. The first contains socioeconomic information, including age, gender, marital status, educational level, profession, and income. The second reports the details of household tangible assets (real estate and automobile), financial assets and liabilities. The third includes information related to the household social security and insurance status and the fourth gives details on households' expenditures. As the majority of rural households live in self-built houses rather than houses purchased on the housing market and they rarely participate in the security market, we focus our portfolio analysis on 3,887 urban households.

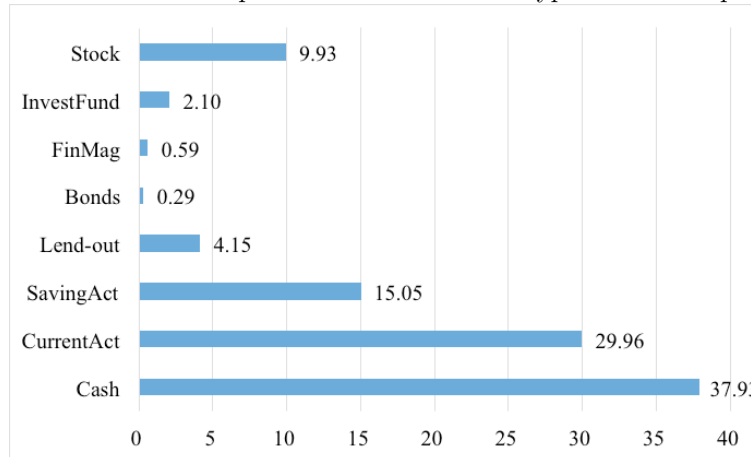
The CHFS data provide comprehensive information on household finances. Household financial assets are reported as cash, bank current accounts, bank savings accounts, money lend-out, bonds (treasury bonds and corporate bonds), bank financial products, stock type mutual funds, and stocks, including listed shares and non-listed firms.¹ Liabilities include home mortgage loans, car loans and education loans. Figure 2 presents the household portfolio composition with ownership rates of different assets and the average share of each type of financial asset in the household portfolio.

Panel A of Figure 2 presents the ownership rates of different asset types in urban household portfolios. Cash and current account deposits are the most widely held financial assets with more than 60% households owning cash and current accounts. This is followed by bank savings accounts, which account for about 22.85%. There are 14.03% urban households investing in stocks and 6.85% households invest in stock type mutual fund. Households

¹Very few households invest in futures, options, foreign currency or gold and these financial asset types are only a small slice of total household wealth. We therefore do not consider such financial assets. Also, the insurance policies are regarded as a type of financial investments by some scholars. We do not consider insurance in this paper because those investment-type insurance policies are very few. This is also consistent with the CHFS data structure.

FIG. 2. Urban Household Portfolio Composition Based on CHFS Data in 2011

Panel A: Ownership rates of different asset types in the sample



Panel B: Average shares of each financial asset in the household portfolio (%)

Notes: Household financial portfolio contains of following type assets: cash, bank current accounts (CurrentAct), bank savings accounts (SavingAct), money lend-out (lend-out), bonds (treasury bonds and corporate bonds), bank financial products (FinMag), stock type mutual funds (InvestFund) and stocks, including listed shares and non-listed firms.

with their money lend-out account for 11.18%. The ownership of other types of financial assets is less than 2% each.

Panel B of Figure 2 indicates the average share of each financial asset in the household financial portfolio. It shows that cash, bank current accounts, and saving accounts comprise 37.93%, 29.96%, and 15.05% of financial assets in the household portfolio, respectively. Investment fund comprises 2.10% and stock comprises 9.93%. The composition shares of other types of financial assets are uniformly less than 5%.

The summary statistics regarding stock investment variables, housing variables and other interested variables of the CHFS urban sample are reported in Table 1.

StockOwnership is used to measure the household's stock market participation. It equals to one if the household involves in the investment on either stock or stock type mutual fund. Otherwise, StockOwnership takes zero values. StockShare measures the degree of stock market participation. It is calculated as the percentage of stock (stock and stock type mutual fund) investments over total financial assets. The effects of housing on household portfolio decisions are measured with two variables. One is house price appreciation (HouseApp1) calculated from the differences between the current housing value and house purchasing price. If households have multiple houses, the housing value refers to the aggregated housing prices. HouseApp1 is used to examine the positive effects of housing on household financial portfolio arrangements. The other housing variable is the house-to-wealth ratio (House2Wealth), calculated as current total house value over household net wealth. Household net wealth is the summation of housing assets and non-housing assets net of loans and informal borrowing. House2Wealth is applied for checking the negative impacts of housing on household financial portfolios.

Table 1 shows that owner-occupied housing is the dominant component of wealth for urban households in China. In our sample, approximately 87.4% of households are urban homeowners. Housing property makes up more than 75% of household net wealth. The average amount of home equity is ¥566,424. The average household head is about 50 years old and in general, each house has three family members.

Table 2 reports the household wealth and portfolio composition according to different housing variables.

In Table 2, households are first grouped into quintiles based on their house value appreciation. It is evident to see that both the stock ownership and stock shares increase monotonically as the house value appreciation increases. Stock market participation rate increases from 9.872% to 33.977%, and stock share increases from 4.626% to 18.706%. Then, households are divided into quintiles according to their house-to-wealth ratio (House2Wealth). It shows that, with the increasing of house-to-wealth ra-

TABLE 1.

Variable definition and summary statistics

	Definition of variables	Mean	Std
StockOwnership	Households invest in stocks =1, otherwise=0	0.181	0.385
StockShare	The percentage of stock and stock type mutual fund investment over total financial assets (%)	9.596	24.064
Demographic variables			
Age	Age of household head	49.824	14.671
Sex	Gender of household head (male=0, female=1)	0.348	0.476
EduYr	Schooling years of household head	11.293	3.846
Marry	Marriage status of household head (Married =1, otherwise=0)	0.835	0.371
RiskAtd	Self-reported attitude towards risk, higher value implies greater risk aversion. 1(5.617%); 2 (8.412%); 3(26.161%); 4(17.902%); 5(40.472%).		
FamilySize	Numbers of household members	3.053	1.258
Region	East region=1(54.912%); Midlands=2 (23.596%); West region=3 (21.082%)		
Financial assets and liabilities			
Cash	Cash at hand (¥1,000)	5.030	25.188
CurrentAct	Bank current accounts (¥1,000)	19.167	88.395
SavingAct	Bank saving accounts (¥1,000)	20.381	87.939
LendOut	Money lent out (¥1,000)	6.878	93.713
Bond	Government and corporate bond (¥1,000)	0.916	16.827
FinMag	Bank managed financial assets (¥1,000)	2.349	28.202
Stock	Stock and stock type mutual fund investment (¥1,000)	24.184	137.61
Loan	Household loan amounts (¥1,000)	1.805	29.471

tio, both stock ownership and stock shares indicate a decrease trend. The second quintile shows the highest stock market participation and highest stock shares, 33.765% and 18.328%, respectively. The 5th quintile shows the lowest stock market participation and lowest stock shares, 0.778% and 0.373%, respectively.

3.2. Model Specification and Identification

The focus of this paper is to examine how housing affects household portfolio choices, characterized by the risky financial assets. The main class of risky financial assets considered is stock ownership and the share

TABLE 1—Continued

	Definition of variables	Mean	Std
Household income, real estate, and total assets			
HouseDum	Homeownership (own house=1, otherwise =0)	0.874	0.332
HouseCurValue	Self-reported house value (¥1,000)	566.424	853.198
HouseOriValue	House purchasing value (¥1,000)	172.795	368.656
HouseApp1	House value appreciation is the difference of current house value and house purchasing value (¥1,000)	394.383	648.144
HouseApp2	House appreciation calculated from current value and CPI adjusted house purchasing value (¥1,000)	364.927	619.711
HouseApp3	House appreciation calculated from community unit price and CPI adjusted house purchasing value (¥1,000)	464.161	841.378
House2Wealth	Total property value over household net wealth	0.754	0.337
HHInc	Household income(¥1,000)	61.921	168.932
NetWealth	Household net wealth (¥1,000)	666.172	986.932
Observations	3,899		

Notes: The statistics are calculated based on urban households from CHFS data in 2011.

invested on risky financial assets over household financial assets. We first investigate how housing affects household stock ownership by running a Probit model.

$$Pr(\text{StockOwnership} = 1) = \Phi(\alpha_1 \text{HouseApp} + \alpha_2 \text{House2Wealth} + \beta' X) \quad (1)$$

Where Φ is the standard normal cumulative distribution function, and X is a vector of control variables.

Then, we employ a Tobit model on the ratio of risky financial assets (measured by StockShare) in order to address the clustering at zero that is caused by many households' holding no risky assets.

$$\begin{aligned} \text{StockShare}^* &= \gamma_1 \text{HouseApp} + \gamma_2 \text{House2Wealth} + \beta' X + u, \quad u \sim N(0, \sigma^2) \\ \text{StockShare} &= \max(0, \text{StockShare}^*) \end{aligned} \quad (2)$$

In both Probit and Tobit models, the impacts of Housing on stock ownership and stock shares are assessed by considering two different measurements. One is house value appreciation (HouseApp) used to test the “wealth effect” of housing on portfolio choices, the other is house-to-wealth

TABLE 2.

Wealth and portfolio composition by different housing groups

	Obs. (%)	StockOwnership (%)	StockShares (¥1,000)	FinAsset (¥1,000)	NetWealth (¥1,000)
Households grouped by house appreciation (HouseApp1) at different quintiles					
(q0~q0.2]	780	9.872	4.626	44.233	107.409
(q0.2~q0.4]	794	10.705	5.373	38.68	227.093
(q0.4~q0.6]	774	14.599	7.456	44.45	333.525
(q0.6~q0.8]	774	21.447	11.929	85.884	635.995
(q0.8~q1.0]	777	33.977	18.706	182.188	2037.201
Households grouped by house-to-net wealth ratio (House2Wealth) at different quintiles					
(q0~q0.2]	807	20.828	9.439	173.089	303.446
(q0.2~q0.4]	807	33.765	18.328	150.888	814.771
(q0.4~q0.6]	816	23.529	12.991	56.459	926.147
(q0.6~q0.8]	800	12.141	7.184	15.204	728.752
(q0.8~q1.0]	805	0.778	0.373	1.841	584.373

Notes: (q0~q0.2] represents the 1st quintile; (q0.2~q0.4] represents the 2nd quintile; and so on.

ratio (House2Wealth) variable used to examine the “crowd-out effect”. A higher house-to-wealth ratio implies a less diversified portfolio, less liquid household assets and greater housing price risk exposure for the households; therefore it may promote the households to reduce risky asset holdings.

A number of variables could explain household portfolio choices (Brueckner, 1997; Campbell, 2006; Chetty and Szeidl, 2015; Dimmock and Kouwenberg, 2010; Flavin and Yamashita, 2011; Goetzmann and Kumar, 2008; Hochguertel and van Soest, 2001; Yogo, 2016). Following the literature, our control variables contain demographic factors (age, age squared, gender, education, marriage status of the household head, and attitude towards risk); variables at the household level include family size, household non-housing wealth, and household income, herein measured with annual household income at the end of the previous year. Household loans include the aggregate outstanding student loans, car loans, and real estate loans. In addition, we add region dummy variables to approximate regional disparities on portfolio choices for households located at different areas. Other characteristics, such as financial literacy or transaction costs, may also play important roles in explaining the observed household portfolio. Their effects are attributed to the model error components due to the unavailability of data.

Two possible endogeneity issues may complicate our estimation. The first complication arises because house value appreciation and household

portfolio decisions may suffer from a reverse causality problem. Since portfolio decisions and housing decisions are often made simultaneously, the choice of equity market participation could be the result of house value appreciation. For example, the rapid appreciation of house value increases household wealth and encourages the household participating in the stock market, boosting their stock investment in the equity market. Nonetheless, it is also plausible that household stock investment affects its housing decision. Stock market prosperity may discourage housing investment, reducing housing capital gains of the household. The second complication arises because omitted variables may impact both house value appreciation and portfolio decisions of the homeowners. For example, external economic shocks such as economic depressions may affect both stock market and housing prices, but they are hard to capture in the empirical estimation. In addition, at the individual level, people with better financial literacy are more likely to participate in the stock market and invest in housing with greater capital gain potential.

To identify the effects of house value appreciation on portfolio decisions of homeowners, we employed an instrumental variable (IV) strategy to address the aforementioned endogeneity issues. A valid IV should be highly correlated with house value appreciation, but uncorrelated with current homeowners' portfolio decisions. In this paper, we follow Chetty and Szeidl (2015) and employ house purchasing price as the IV for house value appreciation of existing homeowners. Our identification rests on the idea that house purchasing prices are positively associated with future house price appreciation (more expensive houses tend to appreciate more in value), whereas the house purchasing prices in the past should be uncorrelated with current homeowners' portfolio decisions, since the transaction of the real estate happened before and the house purchasing prices were primarily dependent upon the supply and demand relationships in the real estate market.

4. RESULTS AND ROBUSTNESS

4.1. Results

Table 3 reports the dual effects of housing on household portfolio choices. The estimates for the listed variables reflect their impacts on likelihood of stock ownership (Probit I and IVProbit I) and proportion of financial assets invested in stocks (Tobit I and IVTobit I).

In each model, housing variables exert dual effects on household portfolio choices. On one hand, house value appreciation (HouseApp1), calculated as the difference between self-reported house value and house purchasing prices, imposes a positive effect on both the likelihood of stock ownership (Probit I and IVProbit I) and the percentage of stock investment over total

TABLE 3.
Housing effects on portfolio choices

	Stock ownership		Stock share	
	(Probit I)	(IVProbit I)	(Tobit I)	(IVTobit I)
HouseApp1	0.002*** (0.000)	0.010*** (0.002)	0.002*** (0.000)	0.007*** (0.001)
House2Wealth	-0.282*** (0.088)	-0.719*** (0.131)	-0.189*** (0.064)	-0.477*** (0.104)
Age	0.062*** (0.013)	0.048*** (0.013)	0.049*** (0.009)	0.045*** (0.010)
Age2	-0.001*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Gender	-0.022 (0.057)	-0.082 (0.055)	-0.022 (0.040)	-0.058 (0.043)
Education	0.061*** (0.009)	0.039*** (0.011)	0.042*** (0.006)	0.032*** (0.007)
Marriage Status	0.121 (0.087)	0.125 (0.080)	0.071 (0.062)	0.083 (0.063)
Risk Attitude	-0.189*** (0.022)	-0.160*** (0.024)	-0.137*** (0.016)	-0.128*** (0.017)
Family size	-0.017 (0.024)	-0.027 (0.022)	-0.009 (0.017)	-0.017 (0.018)
HHIncome	-0.001 (0.002)	-0.004* (0.002)	-0.001 (0.001)	-0.003** (0.001)
NonHousingWealth	0.010*** (0.001)	0.005 (0.003)	0.005*** (0.001)	0.002** (0.001)
Loan	0.002 (0.007)	0.002 (0.010)	0.001 (0.004)	0.001 (0.005)
West	-0.107 (0.084)	-0.099 (0.074)	-0.081 (0.061)	-0.083 (0.062)
East	0.161** (0.068)	-0.177 (0.110)	0.124** (0.049)	-0.075 (0.075)
Constant	-2.483*** (0.365)	-1.488*** (0.478)	-1.905*** (0.268)	-1.433*** (0.299)
Observations	3,778	3,778	3,778	3,778

Notes: * : $p < 0.1$, ** : $p < 0.05$, *** : $p < 0.01$. Standard deviations are in the parenthesis.

financial assets (Tobit I and IVTobit I). On the other hand, the house-to-wealth ratio variable (House2Wealth) in each model uniformly indicates a negative effect on risky financial asset simultaneously, suggesting that a

higher house-to-wealth ratio discourages the household from making stock investments.

The positive effect of housing on household portfolio arrangements can easily be understood through the “wealth effect” mechanism mentioned earlier. The continually rising house prices increase homeowners’ wealth level, enabling households to be more capable of taking more risks. Furthermore, home ownership could also help urban families to hedge the risk of both rent expenditure and inflation, households could balance risk and return by participating in stock investment.

The negative effect of housing on the household portfolio choice can be attributed to background risk. Under the assumption of constant relative risk aversion, people bearing more undiversifiable risk will reduce additional risk exposure brought by risky financial assets such as stock investments. In addition to the widely recognized background risk argument, we believe that, in the specific context of China, the negative association between a higher house-to-wealth ratio and a lower likelihood of stock ownership and less shares invested in equity relates to two types of households with high house-to-wealth ratios. One is urban poor families with real estate being the only valuable asset. They have no additional money to invest in financial assets. Another is households owning multiple houses. These households achieve greater capital gains in the booming housing market and they view housing more from the investment angle. The one-way rising house prices in China make people believe that housing is one of the safest forms of investment. In the absence of property tax, these urban households would rather save for down payments and purchase additional houses rather than involving in the ailing stock market.

Besides the effects of housing, other estimates suggest the influences of social demographic characteristics on household portfolio decisions. We find a hump-shaped age profile for both stock market participation and shares invested in risky financial assets. The propensity for a household to participate in equity market peaks at the age of 31 of the household head. The age effect is consistent with the findings of Flavin and Yamashita (2011), who argue that the portfolio share devoted to risky assets should have a hump-shaped profile with respect to age, because the age of the household head acts as a proxy for the housing collateral effect. The education of the household head also plays an important role in households’ portfolio choices. Better educated households are more likely to participate in equity markets and they usually have a higher proportion of risky financial assets. This is also supported by Abreu and Mendes (2010) who find a positive impact of education on investors’ portfolio diversification.

It is not surprising that, *ceteris paribus*, greater risk aversion reduces the household’s likelihood of investing in equity portfolios and leads to less proportion of risky financial assets. Non-housing wealth significantly in-

creases a household's equity shares in the portfolio, but its effects on the probability of stock market participation is not significant. Other variables, such as gender, marriage status, family size, regions, and mortgage loans are insignificant. Out of our expectation, household income indicates a significant negative effect on stock market participation and stock investment in both IVProbit and IVTobit estimations. A plausible explanation is that the depressing stock market coupled with excessive capital gains from housing market make households divert their money into housing market. Nonetheless, this "flight to quality" phenomenon is mainly applicable to households with greater income.

4.2. Robustness Checks

In above regressions, house value appreciation is calculated as the nominal price differences between self-reported current house value and house purchasing price. To take the effect of inflation into consideration, we make an adjustment on house value appreciation. HouseApp2 is calculated as the differences between self-reported current house value and the house purchasing price inflated by national consumer price indexes (CPI) since the time of obtaining the house. We report the estimates in Table 4. It shows that the dual effects of housing on household portfolio choice are quite similar to the results before.

Another important concern of the effects of the housing on household portfolios is that the self-reported house value may not be precise. Most people in the survey were able to report the purchasing prices of their real estate accurately, but they may subjectively overestimate or underestimate their current house value, hence the house appreciation calculated from the self-reported house value may cause error-in-variable bias in the estimation. To address the possible measurement error problem of house appreciation, we recalculate house appreciation variable. It is widely acknowledged that houses in the same community are comparable. We first calculated the average house price per square metre within the community where the household resides (excluding the studied household). Then we constructed the house value by multiplying the housing area of the household by the average house price per square metre within the community. At last, we calculated the house appreciation as the differences between constructed house value and CPI adjusted house purchasing value (HouseApp3) for each household. Accordingly, we also updated house-to-wealth ratio using constructed house value. We rerun the regressions and present the results in Table 5. Again, house price appreciation positively affects the stock investment, whereas a higher house-to-wealth ratio crowds out riskier investments.

We follow Chetty and Szeidl (2015) and consider house purchasing price as the IV to overcome the endogeneity problem from house value appre-

TABLE 4.
Housing effects on portfolio choices using CPI adjusted house purchasing price

	Stock ownership		Stock share	
	(Probit II)	(IVProbit II)	(Tobit II)	(IVTobit II)
HouseApp2	0.002*** (0.000)	0.012*** (0.002)	0.002*** (0.000)	0.009*** (0.002)
House2Wealth	-0.271*** (0.087)	-0.771*** (0.131)	-0.180*** (0.064)	-0.553*** (0.121)
Age	0.062*** (0.013)	0.042*** (0.014)	0.050*** (0.009)	0.042*** (0.010)
Age2	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Gender	-0.021 (0.057)	-0.089* (0.054)	-0.021 (0.040)	-0.068 (0.044)
Education	0.061*** (0.009)	0.034*** (0.012)	0.043*** (0.006)	0.030*** (0.007)
Marriage Status	0.121 (0.087)	0.120 (0.077)	0.070 (0.062)	0.085 (0.065)
Risk Attitude	-0.190*** (0.022)	-0.150*** (0.026)	-0.137*** (0.016)	-0.127*** (0.017)
Family size	-0.016 (0.024)	-0.025 (0.021)	-0.008 (0.017)	-0.017 (0.018)
HHIncome	-0.001 (0.002)	-0.004* (0.002)	-0.001 (0.001)	-0.003** (0.001)
NonHousingWealth	0.010*** (0.001)	0.004 (0.003)	0.005*** (0.001)	0.002 (0.001)
Loan	0.003 (0.007)	0.007 (0.010)	0.002 (0.004)	0.005 (0.005)
West	-0.108 (0.084)	-0.095 (0.070)	-0.081 (0.061)	-0.084 (0.063)
East	0.166** (0.068)	-0.243** (0.120)	0.128*** (0.049)	-0.136 (0.088)
Constant	-2.498*** (0.365)	-1.215** (0.532)	-1.917*** (0.268)	-1.280*** (0.322)
Observations	3,778	3,778	3,778	3,778

Notes: * : $p < 0.1$, ** : $p < 0.05$, *** : $p < 0.01$. Standard deviations are in the parenthesis.

ciation. However, the validity of the IV could be challenged. To further confirm the exogeneity of the housing variable, we conduct another robust check by examining particularly on those households whose houses were obtained exogenously by dint of unique features of housing system in China.

TABLE 5.
Housing effects on portfolio choices using constructed housing price and
CPI adjusted house purchasing prices

	Stock ownership		Stock share	
	(Probit III)	(IVProbit III)	(Tobit III)	(IVTobit III)
HouseApp3	0.002*** (0.000)	0.007*** (0.002)	0.001*** (0.000)	0.004*** (0.001)
House2Wealth	-0.217** (0.085)	-0.485*** (0.114)	-0.126** (0.062)	-0.313*** (0.082)
Age	0.065*** (0.013)	0.060*** (0.014)	0.052*** (0.009)	0.052*** (0.010)
Age2	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Gender	-0.012 (0.056)	-0.042 (0.055)	-0.011 (0.040)	-0.030 (0.041)
Education	0.062*** (0.009)	0.046*** (0.011)	0.044*** (0.006)	0.036*** (0.007)
Marriage Status	0.133 (0.087)	0.178** (0.084)	0.080 (0.062)	0.117* (0.064)
Risk Attitude	-0.188*** (0.022)	-0.164*** (0.024)	-0.137*** (0.016)	-0.128*** (0.017)
Family size	-0.018 (0.024)	-0.035 (0.023)	-0.012 (0.017)	-0.024 (0.018)
HHIncome	-0.002 (0.002)	-0.006** (0.002)	-0.001 (0.001)	-0.003*** (0.001)
NonHousingWealth	0.010*** (0.001)	0.006* (0.003)	0.005*** (0.001)	0.002*** (0.001)
Loan	-0.001 (0.007)	-0.011 (0.014)	-0.001 (0.004)	-0.007 (0.005)
West	-0.107 (0.083)	-0.101 (0.076)	-0.081 (0.061)	-0.083 (0.061)
East	0.174** (0.068)	-0.094 (0.120)	0.144*** (0.049)	-0.023 (0.068)
Constant	-2.644*** (0.363)	-2.106*** (0.456)	-2.050*** (0.269)	-1.811*** (0.278)
Observations	3,778	3,778	3,778	3,778

Notes: * : $p < 0.1$, ** : $p < 0.05$, *** : $p < 0.01$. Standard deviations are in the parenthesis.

In the CHFS data, house sources are listed as following types: (1) Houses purchased directly from commercial housing markets with either full property right or limited property right; (2) Affordable houses purchased from governments at subsidized prices, also called “economic residence houses”;

(3) Houses obtained from inheritance or endowments; (4) Houses obtained from welfare housing distribution of the work units where household members work at; (5) Cooperative-constructed houses obtained from the work units. The work units raise funds and sell the houses to their employees at the cost of construction; (6) Self-built houses with purchased land from the local governments; (7) Houses obtained from relocation and compensation from collective land expropriation of local governments; (8) House sources are not clear. The house sources and their percentages are reported in Table 6.

TABLE 6.

House sources and their percentage		
	House sources	Percentage
class I	(1) Houses purchased directly from commercial housing markets with either full property right or limited property right	43.65%
	(2) Affordable houses purchased from governments at subsidized prices, also called “economic residence houses”	2.52%
	(6) Self-built houses with purchased land from the local governments	14.61%
	(8) House sources are not clear	3.31%
	Subtotal	64.09%
class II	(3) Houses obtained from inheritance or endowments	4.41%
	(4) Houses obtained from welfare housing distribution from household members’ work units	16.32%
	(5) Cooperative-constructed houses obtained from the work units. The work units raise funds and sell the houses to their employees at the cost of construction.	6.64%
	(7) Houses obtained from relocation and compensation from collective land expropriation of local governments	8.53%
	Subtotal	35.91%

Notes: (1)(2)(3)(4)(5)(6)(7)(8) indicate house sources in the CHFS data. House sources are categorized into class I, and class II, depending on whether the houses are purchased from the housing market or not. Houses in class II are not purchased from the housing markets, and the acquisition of the house is beyond the family’s control. Therefore, the house tenure choice for houses in class II is not interrelated with the household’s portfolio arrangements. The percentage is based on aggregate houses for the sample urban households.

We categorize urban household property sources into two classes: One class includes house source types of (1), (2), (6), (8), with houses accounting for about 64% in the sample. These houses are either purchased directly from the housing markets, or purchase land from real estate markets. Ac-

quiring these houses may be the balanced decisions between house tenure choice and financial portfolio allocations. As a result, including these households in the regression may bias the estimates of housing variables and their impacts on household portfolio arrangements.

Another class includes the rest house sources (3), (4), (5), (7), accounting for about 36% in our sample. Houses in this class are not households' homeownership decision. Rather, the acquisition of these houses depends on the work units that experienced the welfare housing distribution (and cooperative-constructed houses) or past generation's inheritance (endowments) that beyond the family's control. The homeownership for such households is independent of household's financial portfolio decision, thus can be reasonably considered exogenous.

Taking advantage of the CHFS data and unique features of housing reform in China, we conduct the third robust check by repeating the models on the second class households. In this subsample, housing variables can be treated as being exogenous. The results are reported in Table 7, and they are essentially the same as before. Therefore, we further confirm the argument that housing creates dual effects on household portfolio choices, but not vice versa.

5. CONCLUSIONS

It is widely recognized that housing, as an important part of the composition of household assets, plays a crucial role in household portfolio allocations. The extant literature regarding the effects of housing on household financial assets shows contrasting results. This paper investigates the effects of housing on household portfolio choices in the context of China, based on the China Household Finance Survey in 2011.

We consider house purchasing value as the IV and run the IV Probit and IV Tobit models to examine how house value appreciation affects both stock ownership and households' risky financial asset allocations. The empirical results reveal that the house price appreciation generates positive effects on households' investment in equity portfolios, whereas the house-to-wealth ratio imposes adverse impacts on the stock investment. Therefore, housing itself creates trade-off effects on household portfolio choices.

Our findings of the dual effects of housing on the household portfolio differ from those in the previous literature, which emphasizes either one dimension of housing effects. To corroborate our conclusions, we conduct three robust checks. First, we adjust house value appreciation variable through CPI adjusted house purchasing value. Second, we apply another house value appreciation variable based on the constructed current house value and CPI adjusted house purchasing price. Both robust checks consolidate our conclusion that housing exerts dual effects on household port-

TABLE 7.
Housing effects on portfolio choices for subsample households

	Stock ownership		Stock share	
	(Probit IV)	(IVProbit IV)	(Tobit IV)	(IVTobit IV)
HouseApp3	0.003*** (0.001)	0.012** (0.006)	0.002*** (0.001)	0.010* (0.005)
House2Wealth	-1.477*** (0.235)	-1.607*** (0.268)	-0.916*** (0.177)	-1.205*** (0.276)
Age	0.062*** (0.023)	0.049* (0.027)	0.048*** (0.017)	0.046** (0.018)
Age2	-0.001*** (0.000)	-0.001** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Gender	0.002 (0.104)	-0.123 (0.121)	-0.033 (0.075)	-0.131 (0.103)
Education	0.054*** (0.017)	0.012 (0.035)	0.034*** (0.012)	0.008 (0.021)
Marriage Status	0.072 (0.160)	0.083 (0.141)	0.047 (0.116)	0.064 (0.123)
Risk Attitude	-0.118*** (0.043)	-0.085 (0.056)	-0.078** (0.031)	-0.067* (0.034)
Family size	-0.025 (0.051)	-0.014 (0.048)	-0.013 (0.037)	-0.008 (0.039)
HHIncome	0.000 (0.009)	-0.013 (0.012)	0.002 (0.007)	-0.009 (0.010)
NonHousingWealth	0.005** (0.002)	0.001 (0.004)	0.003** (0.001)	0.001 (0.002)
Loan	-0.032 (0.086)	0.002 (0.059)	-0.013 (0.057)	0.009 (0.064)
West	0.003 (0.158)	0.014 (0.132)	0.001 (0.115)	0.011 (0.122)
East	0.217* (0.126)	-0.389 (0.415)	0.171* (0.092)	-0.275 (0.313)
Constant	-1.519** (0.708)	-0.511 (1.080)	-1.322** (0.519)	-0.714 (0.676)
Observations	1,120	1,120	1,120	1,120

Notes: * : $p < 0.1$, ** : $p < 0.05$, *** : $p < 0.01$. Standard deviations are in the parenthesis.

folio choices. Our third robust check is a sub-sample analysis based on the unique setting of the housing system in China. In order to overcome the possible endogeneity problem caused by confounding factors that may affect both housing choice and financial asset allocation within the house-

hold, we take advantage of the comprehensive housing reform in China, and rerun the models on households whose property rights were acquired through the distribution from their work units during the housing privatization reform or inheritance from their past generations. Since these types of homeownership are independent of the household's financial asset allocation, housing variables can be treated as exogenous. The sub-sample regressions further confirm the dual effects of housing on portfolio choices. In addition to housing, other notable findings include a hump-shaped age profile for the equity portfolio. Furthermore, both education and the attitude to risk of the household head appear to be essential elements affecting household portfolio choices.

The empirical results of this paper may provide insights for reconciling the contradicting arguments on the effects of housing on household portfolio choices. Meanwhile, our study could also shed some lights on other developing countries that continue to provide state involvement housing. Housing decision and household portfolio choice are usually simultaneously determined within the households in developed countries. But the privatization reform of state-owned housing in developing countries provides unique features that separate these two decisions.

The unique features of the housing market in China not only offer an interesting background for the study of the association between housing and household financial asset allocation, but also provide policy implications for housing market regulation, such as the urgent introduction of property tax to discourage speculative housing investment. Policy makers may also attempt to open up more avenues for private investment that would benefit economic growth in China.

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