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Housing property rights and subjective wellbeing in urban China

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ABSTRACT

This study explores the relationship between home ownership and subjective wellbeing in urban China. We first present a theoretical model examining the relationship between housing property rights and subjective wellbeing in China. We then test the predictions of the theoretical model using a nationally representative dataset. We find that not only home ownership but also the types of property rights one acquires matter for subjective wellbeing. Moreover, not only whether one has a home loan, but the type of home loan one has matters for subjective wellbeing.

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1. Introduction

In urban China an egalitarianism-oriented housing system was previously used to allocate free houses to urban residents working in the state sector, which was the predominant provider of jobs (Cheng and Beresford, 2012). In the 1990s housing reform gradually abandoned the old system and established a housing market. Since then housing has become a major topic in urban China (Cheng, 2011, 2012). In 2009 the television drama *waju* (Dwelling Narrowness) that depicted the difficulty, and frustration, of buying a home in cities provoked national discussion and debate on housing affordability confronting Chinese households (Liang, 2010). Rapidly rising house prices and increasing housing inequality have been reshaping the Chinese urban landscape and impacting on the subjective wellbeing of the urban population.

There are large economics and psychology literatures on the determinants of subjective wellbeing (see Dolan et al., 2008 for a review). There are, however, relatively few studies on the relationship between home ownership and subjective wellbeing

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(as opposed to the relationship between home ownership and housing satisfaction, for which there are more studies – see review in Zumbro, 2014).² Findings on the relationship between home ownership and subjective wellbeing are mixed. Most studies have found that homeowners have higher subjective wellbeing (see e.g. Stillman and Liang, 2010; Ruprah, 2010; Zumbro, 2014). However, Rossi and Weber (1996) only found weak support for the hypothesis that there is a positive relationship between home ownership and subjective wellbeing, with many variables insignificant. Meanwhile, other studies have found that once one controls for demographic differences, there is no evidence that homeowners have higher subjective wellbeing than non-homeowners (see e.g. Bucchianeri, 2009).

There is a growing body of literature on the determinants of subjective wellbeing in China (see e.g. Cheng, 2014; Cheng and Smyth, 2015a, 2015b; Cheng et al., 2014, 2015, in press; Gao and Smyth, 2011; Knight et al., 2009; Mishra et al., 2014; Wang et al., 2014). This study contributes to this literature through studying the relationship between home ownership and subjective wellbeing in China. This study also contributes to the literature on the socioeconomic, demographic and political effects of housing in comparative perspective (Zavisca and Gerber, in press). We present a theoretical model linking a gradient of property rights in housing to subjective wellbeing in China and empirically test the predictions of the theoretical model. To do so, we use the China Household Finance Survey (CHFS), which was collected from over 5000 urban residents in 2011 from all provinces and municipalities in mainland China, except Xinjiang, Tibet and Inner Mongolia. Compared with other datasets that contain information on home ownership and subjective wellbeing in China, such as the Chinese General Social Survey (CGSS), the CHFS has several advantages. Specifically, with the CHFS we are able to examine a range of ownership forms (full, partial and minor) and not only consider whether homeowners have a home loan, but also the source of the loan. We are also able to control for a rich set of confounding factors, including house value and household wealth.

A problem with examining the effect of home ownership on subjective wellbeing is that the estimates may potentially be biased, reflecting concerns with endogeneity and omitted variables. While this means that our findings have to be viewed with caution, we attempt to address these concerns in a number of ways. To address concerns with omitted variables bias we include a rich set of confounding factors in the regressions, including house value, a number of indicators of household wealth, migration status, work unit (*danwei*), employment relations (*bianzhi*), occupation, industry and province fixed effects.

We use a range of alternative strategies to address concerns about endogeneity. First, of the potentially endogenous variables, income is usually regarded as the most troublesome in subjective wellbeing regressions (see e.g. Knight et al., 2009). We instrument for income using both a conventional instrumental variable (industry-occupation-province yearly household consumption expenditure per capita in the year before the survey) and the approach recently proposed by Lewbel (2012), which is an identification strategy that does not rely on external instruments, but rather, constructs an internal instrumental variable based on the presence of heteroscedasticity in the data.

Second, as an alternative approach to addressing endogeneity we use matching estimates of the average treatment effect of home ownership on life satisfaction.

Third, Ferrer-i-Carbonell and Frijters (2004) suggest that it is important to take account of fixed individual traits in happiness studies. Hence, as a further robustness check on the results from the CHFS, we used panel data for 2009–2011 from the China Health and Nutrition Survey (CHNS) and the 2010–2012 China Family Panel Studies (CFPS) to conduct fixed effects regressions. Each of these approaches is explained in more detail in the methods section. Overall, it is reassuring that the main findings with respect to home ownership are robust across methods.

The only study in the English language literature on the relationship between home ownership and subjective wellbeing in China is Hu (2013), who uses the 2006 CGSS. Hu (2013) examines the relationship between a binary variable, home ownership, and subjective wellbeing. Our study differs from Hu (2013) in several ways. First, we examine a more recent period, using a more recent dataset. Second, in addition to considering the role of a binary variable, home ownership, we examine the role of different types of property rights – full, partial and minor ownership – on subjective wellbeing. Third, unlike Hu (2013), we examine the role of having a mortgage and a range of different sorts of home loans on subjective wellbeing. Fourth, unlike Hu (2013), we attempt to address the endogeneity of income using a range of strategies as discussed above. Finally, and again in contrast to Hu (2013), we control for a wider range of variables including household wealth and house value to minimize omitted variable bias.

Foreshadowing the main results, first, we find that home ownership is positively correlated with life satisfaction. Second, we find that full ownership, partial ownership and minor ownership are each positively related with life satisfaction and that the coefficient on full ownership is larger than partial ownership, which, in turn, is larger than minor ownership, consistent with the predictions of the theoretical model.

2. Conceptual framework

In this section we present a simple model that captures several stylised facts about home ownership. Our model focuses on the different ownership forms that exist in China and how these interact with an individual's subjective wellbeing. In this respect, China not only has renters and homeowners; it also has different forms of home ownership. Homeowners can have full, partial or minor ownership and these differ in terms of security and liquidity. Full ownership is where the owner has a property deed issued by state authority, which is transferrable in the housing market. Partial ownership is where the owner does not have a state-issued property deed. Partial property rights are usually acquired with housing purchased at prices subsidised by

² The related literature that examines the effect of home ownership on housing satisfaction includes Elsinga and Hoekstra (2005) and Diaz-Serrano (2009). There are a few studies for China examining determinants of housing or residential satisfaction, including Chen et al. (2013) and Huang et al. (2015). While related to this study, the main outcome variable of interest – housing satisfaction versus subjective wellbeing – differ. We focus on the effect of housing property rights on a broader measure of wellbeing than these studies.

governments or enterprises. A partial property right gives a homeowner the right to use the property or to sell it after a certain period with restrictions on the treatment of capital gains. This is usually levied in the form of a land use fee (Chen, 1996). Minor homeownership (*xiao chanquan*) refers to housing with limited property rights, built on collectively owned rural land and sold to buyers outside the collective ownership. Theoretically, this form of ownership is not officially recognized and thus illegal in China, although in practice it is a common phenomena in urban villages and suburban areas (Chen, 2010).

To capture these different forms of ownership, consider an individual i . Let x_i refer to the individual's ownership status where $x_i \in \{0, m, p, f\}$. If $x_i = 0$ then the individual is renting, while $x_i \in \{m, p, f\}$ means that the individual is a home owner. If $x_i = f$ then the individual has 'full' ownership, while 'partial' and 'minor' ownership are represented by $x_i = p$ and $x_i = m$ respectively. For homeowners, both security of ownership and liquidity of ownership (i.e. ease of property sale) are ordered with f both more secure and more liquid than p , which is more secure and liquid than m .

There is a range of variables that can affect housing choice for any individual. These include individual characteristics that may directly impinge on life satisfaction, such as wealth, income, occupation and migration status. They also include variables that are exogenous to the individual such as any province effects. In a perfectly unconstrained housing market, an individual's housing choice would be driven by these variables. Identical individuals would make identical housing choices and any empirical relationship between housing and life satisfaction could be an indirect effect of some missing variable.

However, the housing market in China is a constrained market. Individuals face significant restrictions on the types of dwelling that are available to them. Thus, two individuals who are otherwise identical in all aspects may end up with different housing choices due to exogenous factors that are beyond their control and that are otherwise unrelated to life satisfaction. Our approach utilises this exogenous 'randomness' in housing allocations in China to consider the importance of housing for life satisfaction.

Owning a house potentially provides both personal and social benefits relative to renting. For example, renting provides less security of tenure for tenants than if the tenants owned their own home and this may reduce incentives to invest in the local community (see e.g. Hu, 2013; Ruprah, 2010). We would expect that these benefits of home ownership would be reflected in an individual's assessment of their subjective wellbeing.

However, there are also arguments suggesting a negative relationship between home ownership and subjective wellbeing. One important reason could relate to financial capacity. If a household has a home loan, then this may create potential financial stress. An adverse event, such as the loss of employment by one member of a household or an accident requiring expensive health care, may have a greater negative impact on a homeowner with a loan than on either a homeowner without a loan or a renter. Another important reason could relate to mobility. Home ownership might reduce one's flexibility and mobility, lowering subjective wellbeing. Low-income households, in particular, might be forced to take out large mortgages to purchase in distressed neighbourhoods on the city fringes or outer suburbs ('the mortgage belt') and be locked into their locale because of negative equity in their home. This will be particularly problematic if there are declining jobs in the area and the individual is forced to travel long distances for work. This was a common phenomenon in many countries in the fallout from the Global Financial Crisis, contributing to lower subjective wellbeing (Grinstein-Weiss et al., 2011).³

If future uncertainty, such as financial uncertainty and uncertainty over other 'life events', impact the relative subjective wellbeing of homeowners and renters, this should also be reflected in different wellbeing for other types of home ownership in China, such as partial and minor property rights.

To capture the relationship between uncertainty, home ownership and life satisfaction, we need to consider both the existence of home loans and an individual's expectations about the future. We denote the existence of a loan for individual i by the dummy variable L_i where $L_i = 1$ if the individual has a home loan and $L_i = 0$ otherwise.⁴

For uncertainty and risk, let S denote the set of potential future states of the world for an individual, and divide S into two subsets so $S = S_1 \cup S_2$. The set S_1 are those states where there is either no stress on the individual or the level of stress is not sufficient to impinge on the individual's housing decision. The set S_2 are those states of the world where the individual faces negative events that do potentially impinge on their home ownership. For example, S_2 will include those situations where the individual faces financial stress. If the individual is a renter then this stress may force them to move and 'downgrade' their accommodation. If the individual is a homeowner, the stress may force them to sell their house and move to different accommodation.

Let π_j be the probability that a state in S_j , $j = 1, 2$, arises where $\pi_1 + \pi_2 = 1$. Let $u_i(x_i; L_i, S_j)$ be the (expected) utility of individual i in the set of states S_j given their ownership status x_i and their loan status L_i . We would expect:

$$u_i(x_i; 0, S_1) \approx u_i(x_i; 1, S_1) > u_i(x_i; 0, S_2) \geq u_i(x_i; 1, S_2).$$

In other words, an individual or household will have higher utility when not facing financial or other stress than when they are facing such stress. Further, if an individual is facing stress, having a housing loan can only exacerbate that stress and lower their utility.⁵ In states S_1 where there is no relevant stress, we would expect:

$$u_i(f; L_i, S_1) > u_i(p; L_i, S_1) > u_i(m; L_i, S_1) > u_i(0; 0, S_1).$$

³ Also see Chadi (2015) for a discussion on the relationship between the Euro crisis and happiness.

⁴ Clearly for renters, $x_i = 0$ and $L_i = 0$.

⁵ Having a home loan may or may not lower subjective wellbeing significantly in those situations where the individual or household does not face stress. Hence we allow for individual subjective wellbeing in states S_1 to be approximately invariant with regards to loan status.

This reflects the benefits of home ownership relative to renting in these situations and the benefits of more secure ownership on the individual's subjective wellbeing. Similarly, in states S_2 where stress arises, if the individual does not have a home loan we would expect:

$$u_i(f; 0, S_2) > u_i(p; 0, S_2) > u_i(m; 0, S_2) > u_i(0; 0, S_2).$$

This again reflects the benefits of security of property rights and (potentially) liquidity under different forms of ownership when facing stress. Further, it reflects that, in the absence of a home loan, a homeowner is likely to face increased security relative to a renter. Stress may make it difficult for a renter to meet financial obligations (including rent) that can be met or deferred by a homeowner without a home loan. Thus, a renter has a greater risk of moving and losing location specific sunk capital in situations of stress relative to a homeowner who does not have a home loan.

In contrast, in states S_2 , if the homeowner does have a home loan, we would expect this to raise the risk of a forced sale of the home. Again, we would expect:

$$u_i(f; 1, S_2) > u_i(p; 1, S_2) > u_i(m; 1, S_2).$$

This reflects that homeowners with full property rights have greater liquidity to sell their property relative to homeowners with partial property rights. And partial property rights, in turn, are more secure and liquid than minor property rights.

It is not clear, however, whether a renter (who does not have a home loan) would be better off than some or all homeowners in this situation. For example, it is possible that $u_i(0; 0, S_2) > u_i(m; 1, S_2)$, reflecting that a home owner with minor property rights and a home loan might gain lower utility than a renter who is relatively more flexible in this situation.

Given these state-contingent levels of utility, an individual's current subjective wellbeing may be represented by the expected utility over future events. Denoting subjective wellbeing by $U_i(x_i, L_i)$, we have:

$$U_i(x_i, L_i) = \pi_1 u_i(x_i; L_i, S_1) + \pi_2 u_i(x_i; L_i, S_2).$$

It follows that⁶:

- Regardless of whether or not a homeowner has a home loan, we expect subjective wellbeing to rise the more secure and liquid are the individual's property rights over their home. Thus, given their loan status, individuals with full property rights will have higher subjective wellbeing than individuals with partial property rights, which, in turn, will be higher than individuals with minor property rights.
- Given an individual's home ownership status, subjective wellbeing will be higher for an individual without a home loan than an individual with a home loan.
- An individual who rents will have lower subjective wellbeing than a homeowner unless there is a significant risk of an adverse future event. If this risk is significant, a renter may have higher subjective wellbeing than a homeowner with a home loan, particularly if the homeowner has minor property rights.

3. Data

The main dataset used in this study was collected in 2011 through the CHFS administrated by Southwestern University of Finance and Economics in China. The 2011 CHFS employed a stratified three-stage probability proportion to size (PPS) random sample design. The first stage selected 80 counties (including county-level cities and districts) from 2585 counties (primary sampling units, or PSUs) from all provinces and municipalities in mainland China except Xinjiang, Tibet and Inner Mongolia. The second stage selected four neighbourhood committees/villages from each of the selected PSUs at the first stage. The third stage selected 20–50 households (depending on the level of urbanization and economic development) from each of the neighbourhood committees/villages chosen at the previous stage. Every stage of sampling was carried out with the PPS method and weighted by population size.

The 2011 CHFS collected information from 8438 households from rural and urban areas. In this study, we used a sample of 5229 urban respondents who provided information pertaining to housing, subjective wellbeing and other key variables used in this study. Subjective wellbeing was measured by responses to the question: Overall, are you satisfied with your life? Responses were measured on a five-point Likert scale ranging from 1 = very dissatisfied to 5 = very satisfied. The survey contained various questions relating to home ownership, source of ownership, mortgage status, type of loan, housing tenure and housing conditions. The CHFS also collected data on the usual control variables that previous studies suggest are correlated with subjective wellbeing, such as human capital and political capital which are likely to have significant effects on the access of urban Chinese to homeownership (Liu and Mao, 2012).

Table 1 shows life satisfaction for homeowners and non-homeowners who do not have any one of the three types of home ownership (full, partial or minor). The mean life satisfaction of homeowners is consistently higher than non-homeowners. Table 2 presents descriptive statistics on all variables used in the study.⁷ Just under half the sample were male, 84.93% were married and 19% were members of the Chinese Communist Party. The average years of schooling were 10.34 years and the average

⁶ Clearly to go from individual results to population results we need to control for differences in subjective expectations. We do this by including a range of expectations variables, such as property price expectations and expectations of future interest rates, in our empirical analysis.

⁷ The variables are described in detail in the appendix.

Table 1

Life satisfaction by homeownership in urban China, 2011 China Household Finance Survey.

	Mean	Std. dev.	Very dissatisfied (%)	Dissatisfied (%)	Neutral (%)	Satisfied (%)	Very satisfied (%)
Homeownership (<i>N</i> = 4514)	3.75	0.80	0.73	4.24	30.03	49.04	15.96
No homeownership (<i>N</i> = 633)	3.50	0.89	2.22	8.54	37.97	39.24	12.03

Table 2

Descriptive Statistics, 2011 China Household Finance Survey.

Variable	Mean or percentage
Life satisfaction (very dissatisfied = 1, dissatisfied = 2, neutral = 3, satisfied = 4, very satisfied = 5)	3.72
Homeownership (%)	87.70
Full homeownership (%)	72.00
Partial homeownership (%)	5.71
Minor homeownership (%)	3.13
No homeownership (%)	19.16
Number of full homeownership	0.85
Number of partial homeownership	0.06
Number of minor homeownership	0.04
Informal home loan (%)	12.36
Formal home loan (%)	9.71
Housing provident fund loan (%)	2.49
Commercial bank loan (%)	6.63
Portfolio loan (a combination of housing provident fund and commercial bank loans) (%)	0.47
Ln remaining informal home loan	0.13
Ln remaining formal home loan	0.24
Purchased discounted property (%)	12.45
Ln property value per square meter	0.31
Property tenure longer than 15 years (%)	38.88
Male (%)	49.25
Age (years)	48.20
Married (%)	84.79
Education (years)	10.57
Number of social insurance schemes	1.60
Chinese Communist Party member (%)	19.06
Ln household income per capita (RMB/month in 2011)	9.32
Rural-urban migrant (%)	29.94
Household size	3.23
Local public safety (very poor = 1, very good = 5)	3.44
Risk aversion (highest = 1, lowest = 5)	3.77
Economy expectation (very poor = 1, very good = 5)	3.79
Property price expectation (decreases a lot = 1, increases a lot = 5)	3.79
Commodity price expectation (decreases a lot = 1, increases a lot = 5)	4.15
Interest rate expectation (decreases a lot = 1, increases a lot = 5)	3.78
Ln vehicle value	2.00
Ln bank deposit	6.24
Ln share and fund value	0.37
Work unit (six types)	See Appendix T1
Employment relation (four types)	See Appendix T1
Occupation (seven types)	See Appendix T1
Industry (21 types)	See Appendix T1
Province (21 province)	See Appendix T1

monthly income was 1358 RMB. We have variables measuring household wealth (bank deposits, share and fund value and vehicle value), migration status, work unit (*danwei*), employment relations (*bianzhi*), occupation, industry and province in which the respondent resides. We also have a number of proxies for the respondent's personality in the form of variables measuring expectations about the future and attitudes to risk.

Overall, 87.74% of the sample owned homes (i.e. owned a home outright or with a mortgage). Just over 70% of the sample owned one property, while 16.17% owned more than one property. The average number of properties owned was 1.07. CHFS asked questions distinguishing between full ownership, partial ownership and minor ownership. About 70% of the sample had full ownership rights, 16.17% had partial property rights and 7.21% had minor property rights.

Just under 10% of the sample had a formal home loan and 12.36% had an informal loan (consisting mainly of borrowing from friends and relatives). Of those with a formal home loan, 92.67% had a commercial bank loan, 1.87% had a housing provident fund loan and 5.46% had a portfolio loan.⁸ Other property-related variables included house tenure longer than 15 years (38.8% had

⁸ A portfolio loan is a combination of commercial loans provided to the borrower to make up the shortfall in case the housing provident fund loan applied for is not sufficient to pay the house price.

been in their house longer than 15 years)⁹; the natural log of house value per square metre (mean was 0.31); whether the respondent had purchased the property at a discount from their *danwei* (work unit) (12.45% had); whether the respondent thought the property in which he/she lived had appreciated in value (85.35% considered it had) and whether the respondent expected interest rates and property prices to increase.

4. The empirical model

We estimate the following empirical function:

$$LS_i = F(X_i, H_i, \varepsilon_i) \quad (1)$$

where LS is life satisfaction for the i th respondent; X is a vector of personal and provincial characteristics; H is a vector of housing-related characteristics; and ε is the error term. There are different methods to treat subjective wellbeing indicators. In a methodological paper, Ferrer-i-Carbonell and Frijters (2004) suggest that results are not sensitive to the choice of ordinary least squares (OLS), that treats subjective wellbeing variables as cardinal, or ordered probit/logit methods that treats them as ordinal. On theoretical grounds, Ng (1997) advocates treating subjective wellbeing as cardinal. In the main results we do so and use OLS; however, in the robust checks, presented later in the paper, we also present results in which we treat subjective wellbeing as being ordinal.

Our main results that we report below are OLS estimates for the CHFS data. Ferrer-i-Carbonell and Frijters (2004) find that the determinants of subjective wellbeing are sensitive to standardization for individual fixed effects in datasets, which lack variables controlling for personality. Standardization tends to reduce the size of positive coefficients on income because having a personality, which is conducive to higher subjective wellbeing, is also associated with having a higher income. This finding implies that we should instrument for income and control for personality.

We control for personality by including variables measuring a range of expectations about the future and attitudes to risk. Previous research suggests that personality traits are correlated with expectations about the future (see e.g. Oettingen and Mayer, 2002) and risk-taking behavior (see e.g. Zuckerman and Kuhlman, 2000). While our main variables of interest are home ownership, housing property rights, whether the respondent has a loan and, if so, the type of loan, we attempt to minimize potential omitted variables bias using a rich set of controls. Among others, these include various property attributes (house value, house tenure and whether the house was purchased at a discount), various indicators of household wealth (value of bank deposits, shares and vehicles), migration status and work-related variables, such as the respondent's work unit (*danwei*), employment relations (*bianzhi*), occupation and industry in which he/she works.

A potential problem with the OLS estimates is, as Knight et al. (2009) note, unobserved characteristics, such as personal energy, might increase income and subjective wellbeing or higher subjective wellbeing might raise income through higher productivity. Hence, income is endogenous. We attempt to address endogeneity of income in various ways.

The first way is that we instrument for income using industry-occupation-province yearly household consumption expenditure (excluding the respondent's household consumption expenditure) per capita in the year before the survey. This strategy combines the approaches pursued by Luechinger (2009), Luttmer (2005) and Vendrik (2013) who instrument for income by using predicted industry-occupation income and Gao and Smyth (2011) and Kingdon and Knight (2007), who instrument for income by directly using consumption expenditure. Oswald and Powdthavee (2008) use a continuous variable representing the lagged regional house price to instrument for income on the assumption that high house prices act to raise wages in a region. Increases in industry-occupation-province average monthly household consumption expenditure (excluding the respondent's household consumption expenditure) in the year preceding the survey likely reflect industry, occupation and province-wide factors, but not exceptional personal effort by any household member (see Vendrik, 2013). In addition, as Kingdon and Knight (2007, p.86) put it: "Expenditure seems to be a reasonable instrument for income since it is unlikely that measurement error in per capita income will be correlated with measurement error in per capita expenditure". In terms of the exclusion restriction, one would not expect the respondent's life satisfaction to depend on the industry-occupation-province average monthly household consumption expenditure in the previous year.

Vendrik (2013) notes there might be a problem if the instrument is picking up life satisfaction effects associated with occupation or industry choice. This problem stems from people changing jobs not only to raise earnings, but for non-monetary benefits and other unobservable factors that make them happier. We largely address this concern through inclusion of a wide range of work-related variables, including work unit, employment relation, occupation and industry dummies, as well as indicators of non-monetary work-related benefits, such as the number of social insurances. However, we cannot be completely certain that our instrument satisfies the exclusion restriction.

Hence, the second way we instrument for income is using the methodology recently proposed by Lewbel (2012), which is an identification strategy that does not rely on external instruments, but rather, constructs an internal instrumental variable based on the presence of heteroscedasticity in the data. Both Lewbel (2012) and the subsequent literature that has applied it, argues that it

⁹ There is no evidence of multicollinearity between property tenure and sources of homeownership.

is particularly useful as an additional robustness check if one has any concerns about whether the conventional instrument satisfies the exclusion restriction. The Lewbel (2012) method is as follows:

$$Y_1 = X^j \beta_1 + Y_2 r_1 + \xi_1 \quad \xi_1 = \alpha_1 U + V_1 \quad (2)$$

$$Y_2 = X^j \beta_2 + \xi_2 \quad \xi_2 = \alpha_2 U + V_2 \quad (3)$$

Let Y_1 be subjective wellbeing and Y_2 be income. U denotes the individual's unobserved characteristics which affect both his/her subjective wellbeing and income. V_1 and V_2 are idiosyncratic errors. Lewbel (2012) suggests that one can take a vector Z of observed exogenous variables and use $[Z - E(Z)]\xi_2$ as an instrument if:

$$E(X \xi_1) = 0, \quad E(X \xi_2) = 0, \quad \text{cov}(Z, \xi_1, \xi_2) = 0 \quad (4)$$

and there is some heteroskedasticity in ξ_j , Z could either be a subset of X or equal to X . The basis for using $[Z - E(Z)]\xi_2$ as an instrument is that identification is achieved by having regressors that are not correlated with the product of the heteroskedastic errors. As ξ_2 is a population parameter, in practice the sample estimate $\hat{\xi}_2$, obtained from the first stage regression, is used. Hence we use the vector $[Z - E(Z)]\hat{\xi}_2$ as instruments.

It is important to note the assumptions underpinning the Lewbel (2012) approach. Each of the assumptions specified in Eq. (4), are based on population parameters and, as such, are non testable. This is not unique to Lewbel (2012), though, and does not present any major issues in practice because most of the assumptions are standard. Lewbel (2012, pp. 69) states: "These are all standard assumptions, except that one usually either imposes homoscedasticity or allows for heteroskedasticity, rather than requiring heteroskedasticity". This means therefore, the only nonstandard required assumption by Lewbel (2012) is that heteroskedasticity exists in ξ_j .

The exact form of heteroskedasticity requirement as derived in Lewbel (2012) is $\text{cov}(Z, \xi_2^2) \neq 0$, although to approximate this, Lewbel (2012) suggests using the estimate of the sample covariance between Z and squared residuals from the first stage regression linear regression on X to test for this requirement, using the Breusch and Pagan test for heteroskedasticity. This is summarized by Lewbel (2012, p.71) as follows: "... if $\text{cov}(Z, \xi_2^2)$ is close to or equal to zero, then $[Z - E(Z)]\xi_2$ will be a weak or useless instrument, and this problem will be evident in the form of imprecise estimates with large standard errors". One can test for this using the Breusch and Pagan test for heteroskedasticity.

As an alternative to instrumenting for income we use matching estimates of the average treatment effect of home ownership on life satisfaction. We first use coarsened exact matching (CEM) (Iacus et al., 2012) to pre-process the data, such that samples with homeownership are only compared with samples without homeownership from the same province (see e.g. Cheng and Smyth, 2015a; Bateson, 2012). This is to ensure that the effect of home ownership on life satisfaction is net of the impacts of general differences between provinces. OLS is then applied to a matched sample to reduce variation in estimates (Ho et al., 2007). As a further robustness check, we apply propensity score matching (PSM), on the standard conditional independence assumption that, conditional on a set of variables, the treatment variable is independent of potential outcomes (King et al., 2014).¹⁰ In China PSM has been used to estimate the average treatment effect of home ownership on marriage and divorce (Grinstein-Weiss et al., 2014).

As a final robustness check on the results from the CHFS, we provide fixed effects estimates using two alternative, nationally representative datasets; namely, CHNS for the period 2009–2011 and CFPS for the period 2010–2012.¹¹ The advantage of these datasets is that we can better take account of fixed individual traits than with CHFS. The disadvantage is that neither the CHNS, nor the CFPS, contain as richer set of housing variables or control variables as the CHFS. The CHNS contains data on whether the respondent is a homeowner and has a home loan as well as house value and individual and household characteristics. The CFPS contains data on the same key variables as the CHNS, plus full and partial ownership, but does not contain data on minor ownership.

5. Results

The main results, estimated using OLS with cluster-robust standard errors to take into account household correlation, are presented in Table 3. In Column (1) we examine the relationship between home ownership, having a home loan and subjective wellbeing, controlling for individual and household characteristics. In Column (2) we examine the relationship between different property rights, having a home loan and subjective wellbeing, controlling for individual and household characteristics. The specification in Column (3) is similar to that in Column (2), except that we examine the number of full, partial and minor ownership properties the respondent has. The specifications in Columns (4) and (5) consider different types of housing property rights,

¹⁰ In order to predict the probability of being home owners for the PSM estimates, we use the same set of personal, household, institutional, employment and province variables as in the OLS analysis (see the control variables in Table 3 below). This is in line with existing literature on predictors of home ownership in urban China (see e.g. Fu, 2016; Wang and Otsuki, 2015). The logit regression results for the probability of being home owners are available from the authors.

¹¹ The CHNS data was collected by Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health at the Chinese Center for Disease Control and Prevention (see <http://www.cpc.unc.edu/projects/china>). The CFPS data was collected by the Institute of Social Science Survey of Peking University (see <http://www.issu.edu.cn/cfps>).

Table 3
Determinants of life satisfaction, 2011 China Household Finance Survey (OLS results).

	(1)	(2)	(3)	(4)	(5)
<i>Homeownership</i>					
Homeownership	0.224***	(5.59)			
Full homeownership		0.174***	(3.21)	0.179**	(2.77)
Partial homeownership		0.150**	(2.77)	0.135**	(2.24)
Minor homeownership		0.109*	(1.84)	0.0811*	(1.80)
Number of full homeownership			0.152***	(3.72)	
Number of partial homeownership			0.126***	(2.84)	
Number of minor homeownership			0.115*	(1.79)	
<i>Home loan</i>					
Informal home loan	-0.0855*	(-1.87)	-0.0829*	(-1.85)	-0.0869*
Formal home loan	0.0312	(0.77)	0.0320	(0.84)	0.0193
Housing provident fund loan					0.196***
Commercial bank loan					0.00224
Portfolio loan					-0.383**
Ln remaining informal home loan					
Ln remaining formal home loan					-0.0114
					(-0.39)
					-0.000939
					(-0.06)
<i>Other property attributes</i>					
Purchased discounted property				0.0312	(0.82)
Ln value per square meter				0.150***	(3.79)
House tenure >15 years				-0.00419***	(-3.01)
					-0.00396**
					(-2.65)
<i>Control variables</i>					
Male	-0.0675**	(-2.25)	-0.0660**	(-2.15)	-0.0672**
Age	-0.0461***	(-8.00)	-0.0447***	(-7.56)	-0.0452***
Age ² /100	0.0496***	(9.44)	0.0485***	(8.92)	0.0490***
Married	0.314***	(11.43)	0.316***	(11.81)	0.322***
Education	0.00515	(1.35)	0.00432	(1.10)	0.00386
Number of social insurance	0.00871	(0.54)	0.00965	(0.60)	0.0108
China Communist Party member	0.0699**	(2.24)	0.0685**	(2.18)	0.0661**
Ln household income per capita	0.0492***	(5.13)	0.0498***	(4.83)	0.0450***
Rural-urban migrants	0.0452	(1.12)	0.0634	(1.61)	0.0595
Household size	0.000500	(0.04)	0.00416	(0.33)	0.00164
Perceived better public safety					0.127***
Express lower risk aversion					-0.0178
Expect better economy					0.165***
Expect higher housing price					-0.0324**
Expect higher commodity price					0.0225
Expect higher interest rate					0.0244
Ln vehicle value					0.00646***
Ln bank deposit					0.00251
Ln share and fund value					0.0442**
Work unit	No	No	Yes	Yes	Yes
Employment relation	No	No	Yes	Yes	Yes
Occupation	No	No	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
Province	No	No	Yes	Yes	Yes
Constant	3.707***	(17.55)	3.731***	(18.04)	3.803***
N	4850	4850	4850	4590	4590
adj. R ²	0.059	0.057	0.058	0.141	0.138

Notes: t statistics clustered at household level in parentheses.

* p < 0.10.

** p < 0.05.

*** p < 0.01.

different types of loans, other attributes of the house including value, individual and household characteristics, controls for personality and household wealth. The most complete specifications, in Columns (4) and (5) also control for the respondent's work unit (*danwei*), employment relations (*bianzhi*), occupation, industry and province in which the respondent resides.

The main finding in Column (1) is that the coefficient on the dummy variable for home ownership is positive and significant and that the life satisfaction of homeowners is 0.22 points higher than non-homeowners. This result is consistent with the general predictions of the conceptual model in Section 2, abstracting from the nuances of alternative forms of property rights. The main finding in Columns (2), (4) and (5) is that the coefficients on full ownership, partial ownership and minor ownership are positive and significant. Consistent with the predictions of the conceptual model in Section 2, in each case the coefficient on full ownership is larger than that on partial ownership and that the coefficient on partial ownership is larger than that on minor ownership. Similarly, in Column (2), the coefficients on the number of full, partial and minor ownership properties are positive and significant

Table 4

Matching estimates of the average treatment effect of homeownership on life satisfaction, 2011 China Household Finance Survey.

	(1)	(2)	(3)
	OLS after coarsened exact matching on province	Nearest neighbour matching with exact matching on province	Propensity score matching
Homeownership	0.230*** (2.38)	0.197*** (3.03)	0.189*** (3.06)

Notes: *t* statistics for specification 1 and *z* statistics for specifications 2 and 3 in parentheses;* $p < 0.10$.** $p < 0.05$.*** $p < 0.01$.

with the ordering on the magnitude of the coefficients corresponding to that predicted by the conceptual model. These results are robust to the inclusion of controls for housing value and household wealth.

In the Chinese housing market, informal borrowing, such as that among friends and relatives is popular. This is reflected by the fact that more people have an informal home loan (12.36%) than a formal home loan (9.71%). In Columns (1) to (4) the coefficient on having an informal home loan is negative and significant (although only at the 10% level). In Columns (1) to (3) the coefficient on having a formal loan is insignificant. Column (4) considers the specific form of formal loan on subjective wellbeing. We find that the coefficient on having a housing provident fund loan is positive, the coefficient on having a commercial bank loan is insignificant and the coefficient on having a portfolio loan is negative and significant. The positive coefficient on having a housing provident fund loan reflects the benefits that home buyers (mostly public, state and foreign-invested sector employees) receive from such loans, which is equivalent to about a 10% saving on the interest payment, compared to a commercial loan for a typical home purchase (Zheng and Chen, 2009).

The negative coefficient on having a portfolio loan reflects the following. First, the down payment and overall interest rate for a portfolio loan tend to be higher. With a portfolio loan the housing provident fund loan proportion has a lower interest rate than a normal commercial loan. However, with a portfolio loan the commercial loan portion has a higher interest rate than a pure normal commercial bank loan. If the mortgagee has a pure commercial loan, the potential interest rate increase is capped at as low as 3%, but if the buyer chooses a portfolio loan, the potential interest rate increase of the commercial loan portion is capped at as high as 30%. At the same time, the down payment with a portfolio loan (as high as 60%) is higher than with a commercial loan (usually 30%). Chen and Deng (2014, p. 946) state “except in the early years, the interest rate on housing provident fund home loans does not have much advantage compared to that of commercial-bank lending. Usually, the interest rate gap is around 2 percentage points. But if commercial-bank mortgages with preferential terms are available, the gap will be smaller”. Thus, with a portfolio loan, the benefits of a slightly lower interest rate from the housing provident fund loan component is likely to be offset by the higher interest rate on the commercial loan component and higher down payment (Pan and Yang, 2013).

Second, some developers restrict the choice of home loan providers for a portfolio loan. This means that buyers can only choose banks that charge a higher interest rate for portfolio loans. Third, the administrative burden associated with getting approval for a portfolio loan is higher. For instance, mortgagees applying for, and repaying, portfolio loans, need to prepare more documents and sign two contracts because they are dealing with both commercial banks and government agencies. It also takes a longer time (usually several months to half a year) to get approval compared to the other two types of loans (which usually take one or two weeks). Some real estate developers do not accept portfolio loans because the procedure is complicated and it takes them longer to receive payment from the banks and government agencies. For example, it was reported that in Beijing only three out of ten real estate developers were willing to accept portfolio loans (Zhang and Li, 2008). The situation improved immediately after the Global Financial Crisis, but has deteriorated in recent years because of the heated housing market. For instance, in Guangzhou a developer provided a 7% discount to commercial loan mortgagees, but no discount to portfolio loan mortgagees; and another developer asked purchasers to pay additional fees, equivalent to 4% of the house price (Ou, 2013).

The results for individual characteristics and expectations variables are largely as expected and mostly consistent with previous studies (see Dolan et al., 2008). The coefficient on household income per capita is positive and significant in all specifications. The coefficients on vehicle value and share value are positive and significant. The coefficient on house value is positive and significant. The coefficient on being in the property >15 years is negative, but the coefficient is small.

6. Extensions and robustness checks

While various fixed effects are controlled for in the specifications in Table 3, one concern is that subjective wellbeing may also be correlated with provincial effects that are associated with, inter alia, differential housing policies, which could exert an independent impact, or sorting effect, on subjective wellbeing. To address this issue, we first re-estimated all specifications in Table 3 for each province and the results were qualitatively similar across provinces.¹² We also rerun the specification in Column (1) in Table 3 after CEM through which respondents with homeownership are compared with respondents without homeownership from the same province. The results are reported in Column (1) in Table 4. The coefficient for homeownership is positive and statistically significant. We also use nearest neighbour matching with exact matches at the province level and

¹² Results for all 22 provinces are available from the authors.

Table 5
Robustness checks, 2011 China Household Finance Survey.

	(1)		(2)		(3)		(4)		(5)		(6)	
	Two-level mixed-effects linear regression with China Marketization Index at the provincial random-effect level		TSLS regression with mean consumption as IV		TSLS regression with $(z-\bar{z})e_2$ as IV		OLS regression without property tenure		Ordered probit regression		Ordered probit regression with mean consumption as IV	
<i>Homeownership</i>												
Full homeownership	0.191**	(2.11)	0.172**	(2.55)	0.167***	(2.92)	0.167**	(2.52)	0.233**	(2.72)	0.231**	(2.74)
Partial homeownership	0.141**	(2.45)	0.141**	(2.27)	0.126**	(2.39)	0.126*	(2.06)	0.204**	(2.30)	0.212**	(2.57)
Minor homeownership	0.0937*	(1.94)	0.0608*	(1.73)	0.0767*	(1.83)	0.0769*	(1.76)	0.128*	(1.86)	0.113*	(1.79)
<i>Home loan</i>												
Informal home loan	-0.0759*	(-1.76)	-0.0283*	(-1.69)	-0.0587*	(-1.79)	-0.0588*	(-1.96)	-0.103*	(-1.93)	-0.107*	(-1.67)
Housing provident fund loan	0.194**	(3.06)	0.155**	(2.54)	0.206***	(2.92)	0.206***	(3.28)	0.304**	(2.97)	0.278**	(2.61)
Commercial bank loan	0.00516	(0.11)	-0.0322	(-0.62)	0.0146	(0.32)	0.0145	(0.30)	0.00722	(0.10)	0.0145	(0.22)
Portfolio loan	-0.389**	(-2.54)	-0.434***	(-2.92)	-0.371**	(-2.38)	-0.371**	(-2.39)	-0.551**	(-2.56)	-0.553**	(-2.58)
<i>Other house attributes</i>												
Purchased discounted house	0.0349	(0.95)	0.00162	(0.04)	0.0188	(0.52)	0.0188	(0.50)	0.0424	(0.74)	0.0359	(0.63)
Ln value per square meter	0.117***	(3.65)	0.0939**	(2.44)	0.154***	(3.46)	0.154***	(3.87)	0.228***	(4.01)	0.237***	(3.96)
House tenure >15 years	-0.00415***	(-3.10)	-0.00403**	(-2.51)	-0.00226**	(2.02)			-0.00627***	(-3.17)	-0.00654***	(-3.23)
<i>Control variables</i>												
Male	-0.0759**	(-2.33)	-0.0669**	(-2.07)	-0.0751***	(-3.17)	-0.0751**	(-2.32)	-0.111**	(-2.25)	-0.109**	(-2.24)
Age	-0.0432***	(-8.16)	-0.0398***	(-8.75)	-0.0445***	(-9.11)	-0.0445***	(-8.63)	-0.0668***	(-8.29)	-0.0657***	(-8.04)
Age2/100	0.0463***	(9.31)	0.0413***	(9.70)	0.0471***	(10.00)	0.0471***	(9.67)	0.0716***	(9.35)	0.0708***	(9.15)
Married	0.285**	(9.67)	0.255***	(8.06)	0.286***	(8.31)	0.286***	(9.76)	0.408***	(9.28)	0.410***	(9.28)
Education	0.00426	(1.25)	-0.00545	(-1.33)	0.00449	(1.10)	0.00449	(1.30)	0.00622	(1.22)	0.00661	(1.30)
Number of social insurance	0.0134	(1.01)	0.0230*	(1.84)	0.0134	(1.12)	0.0134	(1.02)	0.0176	(0.92)	0.0162	(0.84)
China Communist Party member	0.0320	(1.24)	-0.00299	(-0.13)	0.0352	(1.11)	0.0351	(1.37)	0.0481	(1.28)	0.0413	(1.14)
Ln household income per capita	0.0368***	(3.23)	0.0572***	(4.44)	0.0491***	(3.78)	0.0391***	(3.39)	0.0563***	(3.19)	0.0761***	(3.17)
Rural-urban migrants	0.0754***	(3.01)	0.0722**	(2.46)	0.0698**	(2.31)	0.0698**	(2.72)	0.105***	(2.91)	0.105***	(2.91)
Household size	0.0144	(1.58)	0.0559***	(5.08)	0.0138	(1.47)	0.0138	(1.45)	0.0219	(1.61)	0.0219	(1.61)

Perceived better public safety	0.127***	(8.78)	0.128***	(8.79)	0.127***	(9.68)	0.127***	(8.43)	0.192***	(8.97)	0.192***	(8.82)
Express lower risk aversion	−0.0180*	(−1.77)	−0.00560	(−0.47)	−0.0177*	(−1.80)	−0.0177	(−1.71)	−0.0257*	(−1.65)	−0.0280*	(−1.80)
Expect better economy	0.167***	(12.54)	0.155***	(10.77)	0.165***	(12.24)	0.165***	(12.09)	0.244***	(11.71)	0.245***	(11.84)
Expect higher housing price	−0.0304**	(−2.45)	−0.0256**	(−2.03)	−0.0324**	(−2.44)	−0.0324**	(−2.60)	−0.0497***	(−2.74)	−0.0478***	(−2.61)
Expect higher commodity price	0.0212	(1.50)	0.0231*	(1.68)	0.0217	(1.47)	0.0217	(1.53)	0.0357*	(1.74)	0.0343*	(1.65)
Expect higher interest rate	0.0251	(1.38)	0.0179	(1.13)	0.0256	(1.54)	0.0255	(1.37)	0.0354	(1.32)	0.0358	(1.39)
Ln vehicle value	0.00649***	(7.23)	0.00208	(1.61)	0.00666***	(4.50)	0.00666***	(7.15)	0.0100***	(6.21)	0.00916***	(4.97)
Ln bank deposit	0.00251	(0.69)	−0.00669*	(−1.96)	0.00253	(0.91)	0.00253	(0.67)	0.00352	(0.65)	0.00366	(0.69)
Ln share and fund value	0.0435**	(2.41)	0.0438**	(2.28)	0.0446***	(2.87)	0.0446**	(2.39)	0.0666**	(2.38)	0.0645**	(2.34)
Work unit	Yes		Yes		Yes		Yes		Yes		Yes	
Employment relation	Yes		Yes		Yes		Yes		Yes		Yes	
Occupation	Yes		Yes		Yes		Yes		Yes		Yes	
Industry	Yes		Yes		Yes		Yes		Yes		Yes	
Province	No		Yes		Yes		Yes		Yes		Yes	
Constant	2.769***	(13.24)	0.616	(1.10)	2.600***	(12.91)	2.600***	(12.72)				
Cut 1									−1.042***	(−3.32)	−1.005***	(−3.25)
Cut 2									−0.131	(−0.43)	−0.0949	(−0.32)
Cut 3									1.250***	(4.11)	−0.0949	(−0.32)
Cut 4									2.786***	(9.36)	−0.0949	(−0.32)
Level 2 – Province random effect												
China Marketization Index (variance)	0.000235	(0.15)										
Constant (variance)	0.00767	(0.64)										
Residual (variance)	0.0391	(0.78)										
Tests of endogeneity Robust regression F (Ho: variables are exogenous)				17.671***								
First-stage regression robust F			96.75***		16.88***							
N	4590		4590		4590		4590		4590		4590	

Notes: *t* statistics in parentheses for OLS; *z* statistics in parentheses for TSLS and probit regressions.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 6

Homeownership and life satisfaction, 2009–2011 China Health and Nutrition Survey.

	OLS		Fixed effects	
Homeownership	0.325***	(8.40)	0.102***	(3.13)
Has home loan	0.172	(0.37)	−0.115	(−0.98)
Ln house value per square meter	0.0481***	(4.53)	0.0375**	(2.10)
Control variables	Yes		Yes	
N	5769		4490	

Notes: *t* statistics in parentheses.

Life satisfaction is measured on a 5-point scale (from low to high; mean = 3.64; standard deviation = 0.86). The control variables for OLS are gender, age, age squared, marital status, education, rural-urban migration status, household income per capita, household assets (values of vehicles, production equipment and household appliances), occupation, type of work unit and province. Only urban samples are used.

* $p < 0.10$.** $p < 0.05$.*** $p < 0.01$.

PSM of the probability of homeownership to estimate the average treatment effect of homeownership on happiness. The results are in Columns (2) and (3) in Table 4. The results for home ownership are similar to those reported in Column (1) in Table 3.

In addition, in Column (1) in Table 5, we run a mixed-effects linear regression, which allows for random effects at the province level. The results are similar to those in Column (4) in Table 3.¹³ In particular, the coefficients on housing property rights are positive and significant and the magnitude of the coefficients are as per predicted by the theoretical model. The coefficients on having a home loan and other housing attributes are also the same as in Table 3. The variation in provincial residual parameters is insignificant and the interclass correlation between individual and provincial levels is only 1%. These results show that provincial, or sorting effects, are not a major concern.

In Column (1) in Table 5 we also include the China Marketization Index (Fan et al., 2011). This variable potentially captures economic freedom. Previous studies suggest that economic freedom has a positive effect on subjective wellbeing (see e.g. Gehring, 2013). Ideally, we would like to have included the Chinese Marketization Index in Table 3 to consider how this institutional/policy variable relates to property rights, loan availability and subjective well-being (see Bjornskov et al., 2010). However, the Chinese Marketization Index (and similar indices) is province based, meaning it has the same effect as a province dummy, resulting in multicollinearity. In the two-level mixed effects linear regression model in Column (1) in Table 5, we put the index in level-2 random effects, but it is insignificant.

Columns (2) to (4) in Table 5 report results in we use alternative strategies to deal with endogeneity. In Column (2) we instrument for income using industry-occupation-province monthly household consumption expenditure per capita in the year before the survey. The results of the two-stage least squares regression for the full specification with consumption as an instrument are presented in Column (2). The result of a Durbin-Wu-Hausman chi-square endogeneity test rejects the null hypothesis that income is exogenous. The result of an underidentification test rejects the null hypothesis that consumption is not correlated with income. The result of a weak identification test did not reject the null hypothesis that consumption is strongly correlated with income. The F-statistic against the null that the excluded instruments are irrelevant in the first-stage regression is higher than 10. In sum, our conventional external instrument is found to be a valid instrumental variable. The results with respect to the housing property rights and loan variables as well as other house attributes are the same as in Column (4) in Table 3. The coefficient on income is positive and significant.

While we have attempted to show that consumption is a valid instrument for income, doubt may still linger about the exclusion restriction, which cannot be tested directly. Hence, we report the Lewbel (2012) estimates in Column (3) of Table 5. The Breusch-Pagan test rejects the null of constant variance. The results, in terms of sign and significance for all of the housing variables are identical to those in Column (4) in Table 3. The coefficient on income continues to be positive and significant.

Diaz-Serrano (2009) suggests that duration of residence might also be endogenous if people are more likely to move because they are not satisfied with their housing arrangements. Diaz-Serrano (2009) addresses this issue by re-estimating the specification excluding duration of residence. We do likewise for the full specification. The results are reported in Column (4) of Table 5. The findings are almost identical to those reported in Column (4) of Table 3. In Columns (2) to (4), not only are the coefficients on housing property rights positive and significant, but their magnitudes are consistent with the prediction of the conceptual model in Section 2 in each case.

The results to this point treat subjective wellbeing as cardinal. The final two columns of Table 5 treat subjective wellbeing as ordinal. The ordered logit results in Table 5 do not instrument for income so they are the ordinal equivalent of Column (4) in Table 3. The sign and significance of the variables in the ordered logit are almost the same as the OLS results in Column (4) of Table 3. The final column of Table 5 presents the ordered logit results in which we instrument for income using mean consumption. These results are the ordinal equivalent of the two-stage least squares results presented in the second column of Table 5. The results are the same with respect to the housing property rights variables loan variables, other house attributes and household income.

¹³ For privacy and legal reasons, the CHFS data does not reveal detailed location information other than province. Thus, one cannot further control for more detailed location random effects. A recent study on happiness in China shows that neighbourhood/sorting effects at lower administrative levels are not a major concern (Cheng and Smyth, 2015a). The reason is that in urban China, housing allocation is not solely determined by a tight housing market, thus the effects of housing segregation and neighbourhood stratification, due to housing policies, are not as significant as in Western countries.

Table 7

Homeownership and life satisfaction, 2010–2012 China Family Panel Studies.

	OLS				Fixed effects			
Homeownership	0.153***	(9.31)			0.0671**	(2.00)		
Full homeownership			0.161***	(9.76)			0.0708**	(2.38)
Partial homeownership			0.0609**	(2.33)			0.0363*	(1.59)
Has home loan	0.0336	(1.23)	0.0311	(1.14)	−0.0700	(−1.33)	−0.0701	(−1.33)
Ln house value	0.0156***	(12.35)	0.0154***	(12.25)	0.00587**	(2.57)	0.00589**	(2.58)
Control variables	Yes		Yes		Yes		Yes	
N	29,816		29,816		18,901		18,901	

Notes: *t* statistics in parentheses.

Happiness is measured on a 5-point scale (from low to high; mean = 3.40; standard deviation = 1.04). The control variables for OLS are gender, age, age squared, marital status, socioeconomic status, self-confidence, education, Chinese Communist Party membership, rural-urban migration status, household size, household income, household savings, household share and fund values, household debt, occupation, type of work unit and province. Only urban samples are used.

* $p < 0.10$.** $p < 0.05$.*** $p < 0.01$.

While we have used alternative strategies to address endogeneity and omitted variables bias with our CHFS dataset, given it is cross-sectional we do not have variation over time. Hence, as additional robust checks we employ two alternative panel datasets; namely, the CHNS for 2009 to 2011 and the CFPS for 2010 to 2012. The results for the CHNS are reported in Table 6. Home ownership and house value are positively related to life satisfaction and having a home loan is statistically insignificant. The results for CFPS are reported in Table 7. In alternative specifications, home ownership and having full and partial property rights are positively related to life satisfaction. The coefficient on full ownership is larger than on partial ownership consistent with the conceptual model. House value is positively related with life satisfaction. Having a home loan is insignificant. We do not report the results for the control variables in Tables 6 and 7, but they are consistent with expectations. The results from the panel datasets are consistent with the findings from the CHFS for the variables that are also in the CHNS and CFPS.

7. Conclusion

There is now a large literature exploring the determinants of subjective wellbeing in China. Hu (2013), however, is the only study in English that has focused on the relationship between home ownership and subjective wellbeing in China. This study has contributed to further understanding the relationship between home ownership and subjective wellbeing in China by presenting a theoretical model linking housing property rights to subjective wellbeing in China and empirically testing the theoretical predictions. We use a more recent dataset than Hu (2013), allow for a greater range of ownership forms, not only consider whether homeowners have a home loan, but also consider the source of the loan and control, *inter alia*, for house value and household wealth.

Our main findings are as follows: Home ownership is positively correlated with life satisfaction. Full ownership, partial ownership and minor ownership are positively correlated with life satisfaction. The coefficient on full ownership is larger than partial ownership, which, in turn, is larger than minor ownership. Each of these results are consistent with the predictions of the theoretical model. We find that having a formal home loan is statistically insignificant, but having an informal home loan from friends and relatives is negatively related to life satisfaction, relative to those who own a home without such a loan. We observe heterogeneity across different types of formal loans. Having a housing provident fund loan is positively related to life satisfaction, while having a portfolio loan is negatively related to life satisfaction. We also find that house value is positively related to life satisfaction while long house tenure (> 15 years) is negatively related to life satisfaction. A strength of our findings is that they are robust across a number of different specifications, with different controls, and using a range of strategies to address endogeneity and unobserved heterogeneity across time.

The results have important public policy implications. The first is that subjective wellbeing can be increased by promoting home ownership. The second stems from the heterogeneous nature of property rights and the finding that full ownership has a stronger positive association with life satisfaction than partial property rights and that partial property rights, in turn, are more strongly related with life satisfaction than minor property rights. This result suggests the government can improve subjective wellbeing by laying the ground rules for stronger housing property rights. This relates particularly to the strength of property rights transferred when housing is purchased at subsidised prices from the government or enterprise (partial property rights) and when new housing estates are developed for resettlements, in which minor property rights are common. Finally, while we find that having a formal home loan is not statistically related to subjective wellbeing, the finding that different types of formal loans have a heterogeneous effect on subjective wellbeing has policy implications. In particular, subjective wellbeing could be increased by reconsidering the nature of portfolio loans and the procedures to obtain them.

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Appendix Table 1. Definitions of variables

Life satisfaction	Responses to the question "Overall, how satisfied are you with your life nowadays?" on a five-point Likert-scale (i.e. very dissatisfied, dissatisfied, neutral, satisfied, and very satisfied)
Homeownership	The household owns residential property
Full homeownership	The household has full ownership residential property
Partial homeownership	The household has partial ownership residential property
Minor homeownership	The household has minor ownership residential property
No homeownership	The household does not own any residential property
Number of full homeownership	Total number of full ownership residential properties owned by the household
Number of partial homeownership	Total number of partial ownership residential properties owned by the household
Number of minor homeownership	Total number of minor ownership residential properties owned by the household
Informal home loan	The respondent has a home loan from relatives, friends or other private/informal channels
Formal home loan	The respondent has one or more of the three types of formal home loans, i.e. housing provident fund loan, commercial bank loan or portfolio loan.
Housing provident fund loan	Home loan obtained from the housing provident fund managed by the government
Commercial bank loan	Home loan obtained from a commercial bank
Portfolio loan	A combination of housing provident fund loan and commercial bank loan
Ln remaining informal home loan	Natural logarithm of the amount of unrepaid informal home loan
Ln remaining formal home loan	Natural logarithm of the amount of unrepaid formal home loan
Purchased discounted house	The respondent purchased property at a discounted price from his/her work unit
Ln property value per square meter	Natural logarithm of property value per square meter
Number of social insurance schemes	The number of social insurance schemes (i.e. pension, medical and unemployment insurance and housing provident fund) in which the respondent participates
Chinese Communist Party member	The respondent is a member of the Chinese Communist Party
Rural-urban migrant	Most Chinese are assigned with either rural or urban hukou (household registration). A rural-urban migrant is generally defined as a person working outside his or her place of hukou registration. Rural-urban migrants without a local urban hukou cannot access the same rights and social benefits enjoyed by urban residents.
Household size	The number of household members
Local public safety	Response to the question "What is your perception of public safety in the locality?" on a five-point Likert scale (i.e. very poor, poor, natural, good and very good).
Risk aversion	Response to the question "Which type of project would you invest in if you have the money?" The five options are: unwilling to take any risk; below-average risk and below-average return; average risk and average return; above-average risk and above-average return; and high risk and high return.
Economy expectation	Response to the question "What is your expectation of China's economic prospects in the next three to five years?" The five options are: very poor, poor, almost the same as now, good, very good.
Residential property price expectation	Response to the question "What is your expectation of residential property prices in the coming year?" The five options are: significant decrease, slight decrease, no change, slight increase, significant increase.
Commodity price expectation	Response to the question "What is your expectation of commodity prices in the coming year?" The five options are: significant decrease, slight decrease, no change, slight increase, significant increase.
Interest rate expectation	Response to the question "What is your expectation of interest rates in the coming year?" The five options are: significant decrease, slight decrease, no change, slight increase, significant increase.
Ln vehicle value	Natural logarithm of current value of all vehicles owned by the household
Ln bank deposit	Natural logarithm of current value of all bank deposits (sum of term and demand deposits) owned by the household
Ln share and fund value	Natural logarithm of current value of all shares and funds owned by the household
Work unit (danwei)	Seven types: 1. Government agency; 2. Public institution (shiye danwei; e.g. bus company, public school and water supply); 3. Enterprise; 4. Not-for-profit/non-governmental organization; 5. Military service; 6. Others; 7. None of the above
Employment relation (bianzhi)	Five types: 1. Public servant (gongwuyuan); 2. Employee of public institution (shiye bianzhi); 3. Military servant; 4. Others; 5. None of the above
Occupation	Eight types: 1. Manager/head of government agency/public institution/enterprise; 2. Professional/technician; 3. Officer, clerk and so on; 4. Ordinary employee of business/service sector; 5. Ordinary employee of agriculture/forestry/husbandry/fishery; 6. Operator of equipment/machine; 7. Soldier; 8. None of the above
Industry	22 types: 1. Agriculture/forestry/husbandry/fishery; 2. Mining; 3. Manufacturing; 4. Electrify, gas and water supply; 5. Construction; 6. Transportation, postal and telecommunication services; 7. IT services; 8. Wholesale and retail trades; 9. Hotels, catering services and tourism; 10. Financial services; 11. Real estate; 12. Rental and business services; 13. Scientific research, technological services and geologic examination; 14. Environmental and public services; 15. Resident and other services; 16. Education; 17. Health, social security and social services; 18. Culture, sports and entertainment; 19. Public management and social organization; 20. International organizations; 21. Others; 22. None of the above
Province	21 provinces, municipalities and autonomous administrative regions: Beijing, Tianjin, Hebei, Shanxi, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, and Qinghai

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