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## **Abstract**

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## **Keywords**

rights, property, wellbeing, china, subjective, housing, urban

## **Disciplines**

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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 the property rights one acquires and the source of those property rights matters for subjective wellbeing. Moreover, not only whether one has a home loan, but the type of home loan one has matters for subjective wellbeing.

**Keywords:** Subjective wellbeing, housing property rights, China

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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. 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. In 2009 the television drama *woju* (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 (as opposed to the relationship between home ownership and housing satisfaction, for which there are more studies – see review in Zumbro, 2014). Findings on the relationship between home ownership and subjective wellbeing are mixed. Most studies have found that homeowners have higher subjective wellbeing (see eg. Stillman & 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 eg. Bucchianeri, 2009).

There is a growing body of literature on the determinants of subjective wellbeing in China (see eg. Gao & Smyth, 2011; Knight *et al.*, 2009; Mishra *et al.*, 2014). The existing research on housing and subjective wellbeing in China is very limited. Based on the 2006 China General Social Survey (CGSS), the only housing-specific study published in English finds that home ownership and subjective wellbeing are positively correlated (Hu, 2013). There are three further studies in Chinese (Li *et al.*, 2012; Lin *et al.*, 2012; Sun & Zheng, 2013). Lin *et al.* (2012) also used the 2006 CGSS to examine the effect of home ownership and house price increases on subjective wellbeing. Their findings were that homeowners exhibit higher subjective wellbeing than renters, multi-homeowners have higher subjective wellbeing than single homeowners and that house price rises have a positive effect on subjective wellbeing of homeowners and a negative effect on the subjective wellbeing of renters. Li *et al.* (2012) use the 2009 China Urban Economic Conditions and Psychology Survey to compare the subjective wellbeing of those with full ownership, on one hand, and partial and minor ownership on the other. Their main finding is that the subjective wellbeing of those with full ownership is higher than those with either partial ownership or minor ownership as well as non-homeowners. Sun and Zheng (2013) use data collected in 2010 to compare the subjective wellbeing of those

with, and without, home ownership, owners of commodity property (sold in the open housing market) and housing reform property (sold to occupants at discounted prices). They found that both property types are positively correlated with subjective wellbeing.

This study contributes to the literature on the relationship between home ownership and subjective wellbeing in China by presenting a theoretical model linking a gradient of property rights in housing to subjective wellbeing in China and empirically testing the predictions of the theoretical model. To do so, we use data collected from over 5000 urban residents in 2011 from all provinces and municipalities in mainland China, except Xinjiang, Tibet and Inner Mongolia. We use a more recent dataset than previous studies, allow for a greater range of ownership forms, consider the source through which ownership was acquired and not only consider whether homeowners have a home loan, but also consider the source of the loan. Foreshadowing the main results, first, we find that home ownership is positively correlated with life satisfaction and that having a home loan has a negative effect on life satisfaction. Second, we find that full ownership and partial ownership is positively related with life satisfaction, while minor ownership has a negative effect on life satisfaction. This result is consistent with the predictions of the theoretical model in a world in which there is significant risk of adverse future events.

## **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 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).

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 eg. 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).

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 see this, denote the 'form' of ownership for an individual  $i$  by  $x_i \in \{0, m, p, f\}$ , where  $x_i = 0$  means 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. Thus, 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  $m$ .

Homeowners differ not just by the type of ownership but also by whether or not they have a home loan. 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.<sup>1</sup>

An individual's subjective wellbeing will depend on both their expectations about the future and the potential risks that they face in the future. To start, assume that all individuals have the same expectations. Let  $S$  denote the set of potential future states of the world, 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

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<sup>1</sup> Clearly for renters,  $x_i = 0$  and  $L_i = 0$ .

accommodation. If the individual is a homeowner, the stress may force them to sell their house and move to different accommodation.

Let  $\pi_j$  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.<sup>2</sup> In states  $S_1$  where there is no relevant stress, we would expect:

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

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.

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<sup>2</sup> 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.

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 that:

- 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 data used in this study was collected in 2011 through the China Household Finance Survey (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 2,585 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 8,438 households from rural and urban areas. In this study, we used a sample of 5,229 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 & Mao, 2012).

**[Tables 1 & 2 here]**

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. Just under half the sample were male, 84.93 per cent were married, 29.96 per cent held a rural *hukou* (household registration), 19 per cent were members of the Communist Party and 47.26 per cent lived in the relatively well-developed eastern region. The average years of schooling were 10.34 years and the average monthly income was 1358 RMB.

Overall, 87.74 per cent of the sample owned homes (ie. owned a home outright or with a mortgage). Just over 70 per cent of the sample owned one property, while 16.17 per cent 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 per cent of the sample had full ownership rights, 16.17 per cent had partial property rights and 7.21 per cent had minor property rights.

The survey contained information on the source of homeownership. The main sources of homeownership were purchasing (52.71 per cent) and self-built (33.73 per cent). About 5 per cent acquired the property through inheritance and 3 per cent were resettled following demolition or redevelopment. The constructions of many of the properties in the final category are of poor quality and are removed from the city centre in which many resettled residents used to live. Moreover, it is more difficult to resell them in the market because of their vaguely defined ownership rights. Usually, the property rights in such homes take the form of partial or minor ownership. Ten per cent of the sample had a home loan. Of those with a home loan, 92.67 per cent had a commercial bank loan, 1.87 per cent had a housing provident fund loan and 5.46 per cent had a portfolio loan.<sup>3</sup> Other property-related variables included length of time in the property (mean was 11.8 years); property size (mean was 99.59 square metres); whether the respondent thought the property in which he/she lived had appreciated in value (85.35 per cent considered it had) and whether the respondent expected interest rates and property prices to increase.

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<sup>3</sup> 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.

#### 4. The empirical model

We estimate the following empirical function:

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

where  $LS$  is life satisfaction for the  $i$ th respondent,;  $X$  is a vector of personal and regional characteristics;  $H$  is a vector of housing-related characteristics; and  $\varepsilon$  is the error term.<sup>4</sup>

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.

Ferrer-i-Carbonell and Frijters (2004) find that the determinants of subjective wellbeing are sensitive to standardisation 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 we should instrument for income and control for personality. In the robust checks below, we instrument for income. 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 eg. Oettingen & Mayer, 2002) and risk-taking behavior (see eg. Zuckerman & Kuhlman, 2000).

#### 5. Results

The main results, estimated using OLS with cluster-robust standard error to take into account within-province correlation, are presented in Table 3. In Column (1) we examine the relationship between home ownership and subjective wellbeing, controlling for individual characteristics. The main finding is that the coefficient on the dummy variable for home ownership is positive and significant and that the life satisfaction of homeowners is 0.21 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.

[Table 3 here]

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<sup>4</sup> In the results below we control for the region of China (east, central or west) in which the individual lives. Controlling for the province in which the individual lives, rather than region, does not change the results.

In Column (2) we examine the relationship between the form of home ownership and subjective wellbeing, controlling for individual characteristics. The life satisfaction of those who have full or partial ownership are 0.19 and 0.26 points higher, respectively, while the life satisfaction of those who have minor ownership is 0.13 points lower than renters. This result is consistent with the predictions of the theoretical model presented in Section 2. The negative coefficient on minor ownership is consistent with individuals responding to the risk of adverse future events and likely reflects the lack of security for property rights and inalienability and other restrictions imposed on the usage of the property. Given the insecurity of property rights, developers, as well as homeowners, tend to invest less in construction quality, property management and public facilities associated with the development reducing subjective wellbeing (Deng, 2009). Moreover, given many minor ownership developments occur on rural land in the outer suburbs and on the urban fringes, the negative coefficient might also be a reflection that owners are removed from the amenities and attractions of living in the city proper (Hsing, 2010).

That the coefficient on full ownership is smaller than that on partial ownership in Column (2), most likely reflects that some owners have mortgage loans to repay. This increases their financial burden. This would be consistent with the predictions of the conceptual model presented in Section 2. Column (3) examines this issue directly by reporting results in which full ownership is interacted with having a home loan. The coefficient on the interaction term is negative, consistent with this view.

In Column (4), in addition to individual characteristics and form of homeownership, we consider the number of properties one has, property size, primary property tenure, source of the ownership and whether one has a home loan and the source of the home loan. The sign and significance on form of home ownership is similar to Columns (2) and (3). The coefficient on property tenure is negative and significant, while the coefficient on property size is positive and significant, but the magnitude is small. The number of full and minor ownership properties is positively related to life satisfaction. Each additional full ownership property one has, increases life satisfaction 0.12 points, while each additional minor ownership property one has, increases life satisfaction 0.27 points. This reflects that full and minor ownership properties are often more popular than partial ownership properties among investors, thus contributing positively to the life satisfaction of multi-property owners. The reasons are that full ownership properties are usually better protected by law, are built in better locales and appreciate faster than the other two ownership forms, while minor ownership properties are the easiest to rent out because they are the most affordable among these three types to low income tenants.

In terms of source of ownership, compared with the reference case, purchased property, those with property acquired through inheritance, self-built or resettlement had lower life satisfaction. This finding is related to the quality and location of the housing. Inherited and self-built properties are usually older and more difficult to maintain. Properties

acquired through resettlement are often of low quality and located away from the city centre. We now turn to the type of loan. Consistent with the predictions of the theoretical model in Section 2, the subjective wellbeing of those with a home loan is 0.49 points lower than those without a home loan. Of those who do have a home loan, relative to those with a portfolio loan, those with a housing provident fund loan (0.55 points) and those with a commercial bank loan (0.50 points) have higher life satisfaction.

This result reflects that applying for a portfolio loan is more complicated and one needs to pay additional fees and loan protection insurance. Media reports suggest that mortgagors applying for, and repaying, portfolio loans face a number of difficulties. For instance, they 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 & Li, 2008). The situation has improved since 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 per cent discount to commercial loan mortgagees, but no discount to portfolio loan mortgagees; and another developer asked purchasers to pay additional fees, equivalent to 4 per cent of the house price (Ou, 2013). Some mortgagees have to make higher down payments and monthly repayments in order to persuade developers to accept portfolio loans (Qiu & Pang, 2013). There are many other reports of similar complaints in other cities on the difficulties of using portfolio loans.

The final column is the full specification in which, in addition to the variables in Column (4), we control for the individual's expectations. The findings for form of ownership, number of properties, source of ownership, whether one has a home loan and type of home loan, as well as housing characteristics are largely the same as in the earlier columns. The results for individual characteristics and expectations variables are largely as expected and mostly consistent with previous studies (see Dolan *et al.*, 2008).

The one variable that requires comment is income. Income is insignificant, except in the final column in which the coefficient is negative and weakly significant. The magnitude of the coefficient, however, is very small. The negative coefficient on income reflects the fact it is endogenous. When we instrument for income, below, income is either insignificant or positive. One might be concerned that income is insignificant, even in some cases after instrumenting. This is a common finding in previous studies of the determinants of subjective wellbeing in China. For instance, Knight *et al.* (2009), Mishra *et al.* (2009) and Monk-Turner and Turner (2012) get the same result. While it is not an

issue we address in this paper, these studies suggest that relative income is more important than absolute income for subjective wellbeing (see eg. Mishra *et al.*, 2014).

## 6. Extensions and Robustness Checks

Knight *et al.* (2009) note that unobserved characteristics, such as personal energy, might increase income and subjective wellbeing or higher subjective wellbeing might rise income through higher productivity. Hence, income is endogenous. To address this point, following Gao and Smyth (2011) and Kingdon and Knight (2007), we instrumented for income using monthly household consumption expenditure. 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”. The results of the two-stage least squares regression for the full specification with consumption as an instrument are presented in Table 4. 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. In sum, consumption is found to be a valid instrumental variable. In contrast to the OLS estimates in Column (5) of Table 3, the coefficient on income is positive and significant. This result is consistent with downward bias in the income variable in the OLS results, due to measurement error (Knight *et al.*, 2009). The key results for home ownership remain intact in that those who have full and partial ownership continue to have higher life satisfaction and those who inherited ownership continue to have lower life satisfaction, relative to those who purchased properties. However, whether one has a home loan, the type of home loan one has and the number of properties one has of various ownership forms become insignificant.

[Table 4 here]

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. Thus, we check the robustness of our instrumental variable results 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. The estimation problem is:

$$Y_1 = X' \beta_1 + Y_2 \gamma_1 + \epsilon_1 \quad \epsilon_1 = \alpha_1 U + V_1 \quad (1)$$

$$Y_2 = X' \beta_2 + \epsilon_2 \quad \epsilon_2 = \alpha_2 U + V_2 \quad (2)$$

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. Assume that  $Z$  is a vector of observed exogenous variables; in which typically  $Z=X$ . Lewbel (2012) argues that, if the following hold:

$$E(X\epsilon_1) = 0, \quad E(X\epsilon_2) = 0, \quad Cov(Z, \epsilon_1\epsilon_2) = 0,$$

and there is some heteroscedasticity in  $\epsilon_j$ , one can estimate the set of equations above by using two stage least squares with an estimate of  $[Z - E(Z)]\epsilon_2$  as the instrument. The Breusch-Pagan test for heteroscedasticity rejected the null of a constant variance in each case, which is a precondition for the Lewbel (2012) strategy. We report the Lewbel (2012) estimates in Column (2) of Table 4. The results, in terms of sign and significance are almost identical to the final column of Table 3. The exception is that income is insignificant when we employ the Lewbel internal instrumental variable.

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 (3) of Table 4. The findings are almost identical to those reported in Column (6) of Table 3. The only exception is that income is insignificant.

Although the vast majority of households own only one property, three sources of potential wealth effects may be confounding the effect of homeownership on subjective wellbeing. The first is that wealthy households tend to live closer to city/town centres in which there are good schools, green spaces, shopping centres or public facilities that might be important factors affecting subjective wellbeing. The positive effect of homeownership on subjective wellbeing may be reflecting not only homeownership per se, but also include local amenities and changes in amenities over time and space. The second is that homeownership may be simply a proxy for household wealth, such that it is wealth that has a positive effect on subjective wellbeing. The third is that the housing reform in 1998, during which state employees purchased their properties at discounted prices from work units (although only 13 per cent of the households in our sample did so), resulted in wealth redistribution through which these households might derive higher subjective wellbeing from (potential) capital gain from housing assets.

To address these potential wealth effects, in Column (4) we control for the distance from one's current residence to the nearest city/town centre as well as values of two non-financial assets (houses and vehicles) and three financial assets (demand and term deposits and shares) to examine potential wealth effects on subjective wellbeing. Longer distance from one's residence to the city centre has a negative impact on subjective wellbeing, consistent with recent findings that better commuting improves happiness (Wu, 2014). None of the five asset types has a significant effect, while the coefficient on home

ownership types are similar to Column (5) in Table 4. In a further check (not reported here) we replaced the market value of housing assets with a potential capital gain variable indicating the difference between the purchase price and current market value of the housing asset. The potential capital gain variable is insignificant while the variables of homeownership types remain a significant predictor of subjective wellbeing.

One might be concerned that minor ownership is usually in regions that used to be rural or suburban. Thus, it could be proxying missing variables, such as the population composition in the neighbourhood or poor local public services. As a robust check, we re-estimate the main model excluding minor ownership. We do not report the results, but the main finding is that the results are almost identical to those reported in the final column of Table 3. Hence, the results hold, irrespective if minor ownership is dropped.

Another potential concern might be whether the increase in home owners' subjective wellbeing reflects not only home ownership per se, but also rising housing prices in urban China. To address this, we conducted two robust checks involving interaction effects between number of properties owned and appreciation of property value. The results suggested that this is not a major concern. The first check suggests that each additional property one owns increases life satisfaction by 0.18 points and that if one thinks that one's property has appreciated in value, one's life satisfaction is 0.12 points higher; however, number of properties interacted with thinking one's properties have appreciated in value is insignificant. The second check distinguishes between whether one owns one property or more than one property interacted with thinking that one's property/properties have appreciated in value. The findings confirm that owning one property and owning more than one property are positively related to life satisfaction. Owning more than one property increases life satisfaction by approximately double (0.36 points) the amount that owning one property does (0.19 points). However, when both variables are interacted with property value appreciation, the coefficients are insignificant.

The last concern is that, besides individual fixed effects, subjective wellbeing may also be correlated with provincial random effects that are associated with, *inter alia*, differential housing policies, which could exert an independent impact on subjective wellbeing. To address this, we re-examine all columns in Table 3 using a two-level mixed effects model with individual fixed effects and provincial fixed effects with clustered standard errors. The results, which are not reported here, show that there is no substantial change to the individual parameters and that the variation of provincial parameter is mildly significant but small (0.009). The interclass correlation between individual and provincial levels is only 1 per cent; thus provincial effects are not a major concern.

The results to this point treat subjective wellbeing as cardinal. The final two columns of Table 4 treat subjective wellbeing as ordinal. The ordered logit results in Table 4 do not

instrument for income so they are the ordinal equivalent of Column (5) in Table 3. The sign and significance of the variables in the ordered logit are almost the same as the OLS results in Column (5) of Table 3. The exception, again, is that income is insignificant. The final column of Table 4 presents the ordered logit results in which we instrument for income using consumption. These results are the ordinal equivalent of the two-stage least squares results presented in the first column of Table 4. There are more significant variables than in the two-stage least squares regression and the sign and significance for the housing variables are similar to the full specification in Table 3. To be specific, full and partial ownership is positively related to life satisfaction, while minor ownership is negatively related to life satisfaction. Duration of residence and property size are significant, but the coefficients are very small. Number of full and minor home ownership properties is positively correlated with life satisfaction. Home ownership acquired through inheritance and resettlement has a negative effect on life satisfaction, relative to purchasing in the market. Those with a home loan have lower life satisfaction. Of those with a home loan, those with a housing provident fund loan or commercial bank loan have higher life satisfaction than those with a portfolio loan. As with the two-stage least squares results, the coefficient on income is positive and significant.

## **7. Conclusion**

There is now a large literature exploring the determinants of subjective wellbeing in China. There are, however, only a few studies that have 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 previous studies, allow for a greater range of ownership forms, consider the source through which ownership was acquired and not only consider whether homeowners have a home loan, but also consider the source of the loan.

The main finding is that home ownership is positively correlated with life satisfaction. Breaking this down further, full ownership and partial ownership is positively related with life satisfaction, while minor ownership has a negative effect on life satisfaction. This finding is perfectly consistent with the predictions of the theoretical model if there is significant risk of adverse future events. Similarly consistent with the predictions of the theoretical model, having a home loan has a negative effect on life satisfaction, while for those with a home loan, having a housing provident fund loan or commercial bank loan results in higher life satisfaction than having a portfolio loan. The source of home ownership also matters. Relative to those who purchased their homes, those who inherited their homes, built their homes or received them as part of a resettlement compensation package generally have lower life satisfaction. The coefficients on length of residence and property size were mostly very small in magnitude or insignificant.

The results have important public policy implications. At a base level, the results suggest that subjective wellbeing can be increased by promoting home ownership. However, this only tells part of the story. At a deeper level, the results suggest that not all home ownership forms are alike. Policies to promote full and partial ownership should be favoured over promoting minor ownership. The results for the source of ownership also speak to this point. Compared with purchasing in the market, acquiring property through resettlement schemes lower subjective wellbeing. The problem is that such schemes typically only provide very limited property rights in relatively poor quality housing, usually far removed from the city and with limited public amenities. The public policy implications is that the government can improve subjective wellbeing by laying the ground rules for stronger property rights in housing developments for resettlements and encouraging construction in locales closer to the city centre and in areas equipped with better infrastructure. The results also reveal that full and minor ownership properties are popular in the (informal) housing market, making multi-property owners of these two types happier. In fact, it has been a dilemma for the authorities to deal with the increasing volume of minor ownership properties which are essentially illegal but provide affordable housing for lower socio-economic status groups such as migrants (Song *et al.*, 2008). Our results support the suggestion to level up minor ownership with partial ownership by granting the former legal status. Nonetheless, this relates to the land use policy in China, and, thus, needs to be addressed in a broader legal and institutional framework.

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**Table 1: Life Satisfaction by Homeownership**

|                          | Mean | Std. Dev. | Very dissatisfied (%) | Dissatisfied (%) | Neutral (%) | Satisfied (%) | Very satisfied (%) |
|--------------------------|------|-----------|-----------------------|------------------|-------------|---------------|--------------------|
| Homeownership (N=4558)   | 3.75 | 0.80      | 0.72                  | 4.21             | 30.08       | 49.06         | 15.93              |
| No homeownership (N=640) | 3.50 | 0.89      | 2.34                  | 8.44             | 38.13       | 39.06         | 12.03              |

**Table 2: Descriptive Statistics**

| Variable  | Mean or proportion |
|---|--------------------|
| Life satisfaction level (very unsatisfied=1, unsatisfied=2, neutral=3, satisfied=4, very satisfied=5) | 3.72               |
| Male (%)  | 49.18              |
| Age (years)   | 48.15              |
| Schooling (years)   | 10.34              |
| Married (%)   | 84.93              |
| Household size  | 3.23               |
| Rural <i>hukou</i> (%)  | 29.96              |
| Chinese Communist Party (CCP) member (%)  | 19.04              |
| Number of social insurance schemes participated   | 1.61               |
| Monthly income (RMB/month in 2011)  | 1358.67            |
| Monthly consumption (RMB/monthly in 2010)   | 606.49             |
| Homeownership (%)   | 87.74              |
| Distance from nearest city/town centre by individual means of transportation (minutes)                | 39.26              |
| Market value of housing assets (million RMB)  | 1.13               |
| Market value of vehicles (million RMB)  | 0.05               |
| Demand deposit (million RMB)  | 0.02               |
| Term deposit (million RMB)  | 0.03               |
| Market value of shares (million RMB)  | 0.02               |
| Own one property (%)  | 71.57              |
| Own more than one property (%)  | 16.17              |
| Own full homeownership property (%)   | 70.44              |
| Own partial homeownership property (%)  | 15.37              |
| Own minor homeownership property (%)  | 7.21               |
| Number of properties owned  | 1.07               |
| Number of full homeownership properties   | 0.85               |
| Number of partial homeownership properties  | 0.11               |
| Number of minor homeownership properties  | 0.08               |
| Source of homeownership (%)   |                    |
| Purchased   | 52.71              |
| Inherited/transferred   | 4.54               |
| Self-built  | 33.73              |
| Resettled/compensated due to redevelopment/demolition   | 6.30               |
| Others  | 2.73               |
| Property tenure (years)   | 11.80              |
| Property size (m <sup>2</sup> )   | 99.59              |
| Property value appreciated (%)  | 85.35              |
| Has home loan (%)   | 10.08              |
| Type of home loan (%)   |                    |
| Housing provident fund loan   | 1.87               |
| Commercial bank loan  | 92.67              |
| Portfolio loan (combination of housing provident fund and commercial bank loans)                      | 5.46               |
| Local public safety <sup>1</sup> (very poor=1, very good=5)   | 3.44               |
| Risk aversion <sup>2</sup> (highest=1, lowest=5)  | 2.24               |
| Economy expectation <sup>3</sup> (very poor=1, very good=5)   | 3.78               |
| Property price expectation <sup>4</sup> (decreases a lot=1, increases a lot=5)                        | 3.79               |
| Commodity price expectation <sup>5</sup> (decreases a lot=1, increases a lot=5)                       | 4.14               |
| Interest rate expectation <sup>6</sup> (decreases a lot=1, increases a lot=5)                         | 3.75               |
| Region  |                    |
| West  | 13.50              |
| Central   | 39.24              |
| East  | 47.26              |

## Notes:

1. What is your perception of public safety in the locality?
2. Risk aversion: Which type of project would you invest in if you have the money? (1=unwilling to take any risk; 2=below-average risk and below-average return; 3= average risk and average return; 4= above-average risk and above-average return; 5=high risk and high return)
3. What is your expectation of China's economic prospects in the next three to five years?
4. What is your expectation of property prices in the coming year?
5. What is your expectation of commodity prices in the coming year?
6. What is your expectation of interest rates in the coming year?

**Table 3: Determinants of Life Satisfaction (OLS Results)**

|  | 1           |          | 2           |          | 3           |          | 4           |         | 5           |         |
|--|-------------|----------|-------------|----------|-------------|----------|-------------|---------|-------------|---------|
| Male (ref: female)                           | -0.0877***  | (-3.34)  | -0.0866***  | (-3.29)  | -0.0820***  | (-3.11)  | -0.0931***  | (-3.18) | -0.0965***  | (-3.41) |
| Age  | -0.0535***  | (-10.41) | -0.0529***  | (-10.30) | -0.0518***  | (-10.08) | -0.0545***  | (-9.40) | -0.0478***  | (-8.52) |
| Age <sup>2</sup>                             | 0.000563*** | (11.40)  | 0.000560*** | (11.31)  | 0.000548*** | (11.07)  | 0.000562*** | (10.19) | 0.000498*** | (9.35)  |
| Schooling                                    | 0.0108**    | (2.46)   | 0.0109**    | (2.47)   | 0.00995**   | (2.24)   | 0.00768     | (1.54)  | 0.0112**    | (2.32)  |
| Married (ref: no)                            | 0.320***    | (8.59)   | 0.317***    | (8.50)   | 0.325***    | (8.71)   | 0.282***    | (6.59)  | 0.254***    | (6.16)  |
| Household size                               | -0.00485    | (-0.47)  | -0.00340    | (-0.33)  | -0.000207   | (-0.97)  | -0.0186     | (-1.56) | -0.0118     | (-1.03) |
| Rural hukou (ref: urban)                     | 0.0246      | (0.71)   | 0.0309      | (0.88)   | 0.0337      | (0.97)   | 0.0292      | (0.71)  | 0.0365      | (0.92)  |
| CCP member (ref: no)                         | 0.0935***   | (2.76)   | 0.0928***   | (2.74)   | 0.0943***   | (2.78)   | 0.0932**    | (2.51)  | 0.0687*     | (1.92)  |
| No. of social insurance                      | 0.0408***   | (3.10)   | 0.0399***   | (3.03)   | 0.0439***   | (3.32)   | 0.0481***   | (3.27)  | 0.0587***   | (4.15)  |
| LnIncome                                     | -0.00266    | (-0.53)  | -0.00254    | (-0.50)  | -0.00287    | (-0.57)  | -0.00476    | (-0.83) | -0.00942*   | (-1.72) |
| Homeownership (ref: no)                      | 0.214***    | (5.70)   |             |          |             |          |             |         |             |         |
| Own partial homeownership property (ref: no) |             |          | 0.260***    | (4.72)   | 0.247***    | (4.36)   | 0.389***    | (3.61)  | 0.376***    | (3.63)  |
| Own full homeownership property (ref: no)    |             |          | 0.188***    | (5.28)   | 0.200***    | (5.50)   | 0.235***    | (2.65)  | 0.248***    | (2.90)  |
| Own minor homeownership property (ref: no)   |             |          | -0.130*     | (-1.85)  | -0.116*     | (-1.86)  | -0.160**    | (-2.08) | -0.149**    | (-2.02) |
| Home loan (ref: no)                          |             |          |             |          | -0.176*     | (1.66)   | -0.491***   | (-3.24) | -0.489***   | (-3.37) |
| Own full homeownership property × Home loan  |             |          |             |          | -0.214*     | (-1.64)  |             |         |             |         |
| Property tenure                              |             |          |             |          |             |          | -0.00320*   | (-1.73) | -0.00408**  | (-2.29) |
| Property size                                |             |          |             |          |             |          | 0.000885*** | (3.38)  | 0.000784*** | (3.12)  |
| No. of partial homeownership properties      |             |          |             |          |             |          | 0.0535      | (1.19)  | 0.0569      | (1.32)  |
| No. of full homeownership properties         |             |          |             |          |             |          | 0.108***    | (3.19)  | 0.0939***   | (2.90)  |
| No. of minor homeownership properties        |             |          |             |          |             |          | 0.266***    | (2.83)  | 0.274***    | (3.05)  |
| Source of homeownership (ref: purchased)     |             |          |             |          |             |          |             |         |             |         |
| Inherited/transferred                        |             |          |             |          |             |          | -0.189***   | (-2.60) | -0.172**    | (-2.46) |
| Self-built                                   |             |          |             |          |             |          | -0.0695*    | (-1.70) | -0.0448     | (-1.14) |
| Resettled/compensated                        |             |          |             |          |             |          | -0.139**    | (-2.52) | -0.106**    | (-1.99) |
| Others                                       |             |          |             |          |             |          | -0.0226     | (-0.27) | 0.00427     | (0.05)  |
| Type of home loan (ref: portfolio loan)      |             |          |             |          |             |          |             |         |             |         |
| Housing provident fund loan                  |             |          |             |          |             |          | 0.548***    | (3.14)  | 0.546***    | (3.26)  |
| Commercial bank loan                         |             |          |             |          |             |          | 0.495***    | (3.08)  | 0.521***    | (3.38)  |
| Perceive better local public safety          |             |          |             |          |             |          |             |         | 0.155***    | (10.14) |
| Express lower risk aversion                  |             |          |             |          |             |          |             |         | 0.0145      | (1.20)  |
| Expect better economy                        |             |          |             |          |             |          |             |         | 0.183***    | (11.26) |
| Expect higher house price                    |             |          |             |          |             |          |             |         | -0.0235     | (-1.47) |
| Expect higher commodity price                |             |          |             |          |             |          |             |         | 0.00312     | (0.17)  |
| Expect higher interest rate                  |             |          |             |          |             |          |             |         | 0.0263      | (1.30)  |
| Region                                       | Controlled  |          | Controlled  |          | Controlled  |          | Controlled  |         | Controlled  |         |
| Constant                                     | 4.264***    | (28.63)  | 4.257***    | (28.54)  | 4.267***    | (28.59)  | 4.247***    | (24.21) | 2.765***    | (12.70) |
| <i>N</i>                                     | 4127        |          | 4128        |          | 4125        |          | 3231        |         | 3231        |         |
| adj. <i>R</i> <sup>2</sup>                   | 0.064       |          | 0.064       |          | 0.0679      |          | 0.072       |         | 0.146       |         |

*t* statistics in parentheses\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table 4: Robust Checks**

|  | (1)                                       |         | (2)   |         | (3)                                       |         | (4)   |         | (5)                      |         | (6)  |         |
|--|---|---------|---|---------|---|---------|---|---------|--------------------------|---------|--|---------|
|  | TSLS regression<br>with consumption as IV |         | TSLS regression<br>with $(z - \bar{z})\hat{\epsilon}_2$ as IV |         | OLS regression<br>without property tenure |         | OLS regression with<br>potential wealth effects |         | Ordered logit regression |         | Ordered logit regression<br>with consumption as IV |         |
| Male (ref: female)                           | -0.753**                                  | (-2.19) | -0.0778**   | (-2.30) | -0.0965***                                | (-3.44) | -0.0967***                                      | (-3.40) | -0.251***                | (-3.44) | -0.112***  | (-2.94) |
| Age  | -0.0771***                                | (-3.91) | -0.0472***  | (-8.40) | -0.0481***                                | (-8.69) | -0.0475***                                      | (-8.44) | -0.129***                | (-8.62) | -0.0656***   | (-8.23) |
| Age <sup>2</sup>                             | 0.00150***                                | (2.85)  | 0.000472***   | (8.00)  | 0.000495***                               | (9.41)  | 0.000498***                                     | (9.33)  | 0.00134***               | (9.41)  | 0.000689***  | (8.99)  |
| Schooling                                    | 0.0385**                                  | (2.12)  | 0.0104**  | (2.13)  | 0.0118**                                  | (2.47)  | 0.0117**  | (2.40)  | 0.0224*                  | (1.78)  | 0.00729  | (1.10)  |
| Married (ref: no)                            | 0.344***                                  | (3.29)  | 0.252***  | (6.15)  | 0.263***                                  | (6.45)  | 0.249***  | (5.99)  | 0.626***                 | (5.80)  | 0.318***   | (5.63)  |
| Household size                               | 0.0327                                    | (0.92)  | -0.0132   | (-1.15) | -0.0121                                   | (-1.07) | -0.0106   | (-0.92) | -0.0349                  | (-1.19) | -0.00461   | (-0.30) |
| Rural hukou (ref: urban)                     | -0.824*                                   | (-1.83) | 0.0612  | (1.31)  | 0.0343                                    | (0.87)  | 0.0395  | (0.99)  | 0.0664                   | (0.65)  | 0.0470   | (0.89)  |
| Party member (ref: no)                       | 0.0489                                    | (0.59)  | 0.0690*   | (1.94)  | 0.0709**                                  | (2.01)  | 0.0677*   | (1.89)  | 0.175*                   | (1.92)  | 0.0784   | (1.63)  |
| Social insurance                             | -0.962*                                   | (-1.83) | 0.0877***   | (2.73)  | 0.0567***                                 | (4.04)  | 0.0578***                                       | (4.06)  | 0.143***                 | (3.89)  | 0.0691***  | (3.59)  |
| LnIncome                                     | 0.639*                                    | (1.91)  | -0.0281   | (-1.45) | -0.00875                                  | (-1.61) | -0.00879  | (-1.60) | -0.0225                  | (-1.59) | 0.103***   | (5.21)  |
| Own partial homeownership property (ref: no) | 0.605**                                   | (2.25)  | 0.368***  | (3.55)  | 0.328***                                  | (3.24)  | 0.244***  | (2.86)  | 0.995***                 | (3.54)  | 0.473***   | (3.41)  |
| Own full homeownership property (ref: no)    | 0.573**                                   | (2.22)  | 0.236***  | (2.76)  | 0.198**                                   | (2.40)  | 0.373***  | (3.60)  | 0.630***                 | (2.83)  | 0.314***   | (2.76)  |
| Own minor homeownership property (ref: no)   | -0.163                                    | (-0.95) | -0.149**  | (-2.02) | -0.146**                                  | (-2.00) | -0.134*   | (-1.81) | -0.366*                  | (-1.90) | -0.204**   | (-2.07) |
| Property tenure                              | 0.00313                                   | (0.58)  | -0.00422**  | (-2.37) |   |         | -0.00423**                                      | (-2.37) | -0.00902**               | (-1.96) | -0.00525**   | (-2.19) |
| Property size                                | -0.000332                                 | (-0.41) | 0.000819***   | (3.24)  | 0.000914***                               | (3.72)  | 0.000827***                                     | (3.26)  | 0.00220***               | (3.32)  | 0.000915***  | (2.70)  |
| No. of partial homeownership properties      | 0.0254                                    | (0.25)  | 0.0577  | (1.35)  | 0.0566                                    | (1.32)  | 0.0507  | (1.18)  | 0.147                    | (1.13)  | 0.00677  | (1.20)  |
| No. of full homeownership properties         | -0.0607                                   | (-0.56) | 0.0985***   | (3.02)  | 0.0953***                                 | (2.97)  | 0.0933***                                       | (2.86)  | 0.267***                 | (3.13)  | 0.105**  | (2.38)  |
| No. of minor homeownership properties        | 0.293                                     | (1.40)  | 0.272***  | (3.03)  | 0.242***                                  | (2.73)  | 0.266***  | (2.95)  | 0.732***                 | (3.02)  | 0.334***   | (2.79)  |
| Source of homeownership (ref: purchased)     |   |         |   |         |   |         |   |         |                          |         |  |         |
| Inherited/transferred                        | -0.357*                                   | (-1.83) | -0.166**  | (-2.38) | -0.190***                                 | (-2.79) | -0.173**  | (-2.48) | -0.394**                 | (-2.15) | -0.170*  | (-1.81) |
| Self-built                                   | -0.149                                    | (-1.41) | -0.0419   | (-1.07) | -0.0767**                                 | (-2.06) | -0.0472   | (-1.20) | -0.125                   | (-1.24) | -0.0471  | (-0.90) |
| Resettled/compensated                        | 0.175                                     | (0.90)  | -0.114**  | (-2.12) | -0.101*                                   | (-1.92) | -0.109**  | (-2.05) | -0.259*                  | (-1.88) | -0.143**   | (2.79)  |
| Others                                       | 0.182                                     | (0.88)  | -0.000766   | (-0.01) | -0.00499                                  | (-0.06) | 0.00272   | (0.03)  | 0.0551                   | (0.27)  | -0.000877  | (-0.01) |
| Home loan (ref: no)                          | -0.160                                    | (-0.43) | -0.498***   | (-3.43) | -0.469***                                 | (-3.25) | -0.487***                                       | (-3.35) | -1.145***                | (-2.93) | -0.606***  | (-3.14) |
| Type of home loan (ref: portfolio loan)      |   |         |   |         |   |         |   |         |                          |         |  |         |
| Housing provident fund loan                  | 0.121                                     | (0.27)  | 0.558***  | (3.33)  | 0.537***                                  | (3.23)  | 0.548***  | (3.27)  | 1.304***                 | (2.94)  | 0.701***   | (3.14)  |
| Commercial bank loan                         | -0.0269                                   | (-0.06) | 0.537***  | (3.47)  | 0.515***                                  | (3.36)  | 0.513***  | (3.32)  | 1.238***                 | (3.00)  | 0.657***   | (3.21)  |
| Perceive better local public safety          | 0.0550                                    | (0.91)  | 0.158***  | (10.20) | 0.153***                                  | (10.09) | 0.156***  | (10.22) | 0.424***                 | (10.46) | 0.202***   | (9.17)  |
| Express lower risk aversion                  | -0.00178                                  | (-0.06) | 0.0150  | (1.25)  | 0.0143                                    | (1.20)  | 0.0138  | (1.15)  | 0.0382                   | (1.24)  | 0.0108   | (0.67)  |
| Expect better economy                        | 0.143***                                  | (3.44)  | 0.183***  | (11.34) | 0.181***                                  | (11.28) | 0.180***  | (11.01) | 0.490***                 | (11.28) | 0.246***   | (10.59) |
| Expect higher house price                    | -0.0750*                                  | (-1.68) | -0.0223   | (-1.39) | -0.0234                                   | (-1.48) | -0.0270*  | (-1.67) | -0.0676                  | (-1.62) | -0.0299  | (-1.39) |
| Expect higher commodity price                | -0.00665                                  | (-0.16) | 0.00345   | (0.19)  | 0.000338                                  | (0.02)  | 0.00581   | (0.32)  | 0.00951                  | (0.21)  | -0.00148   | (-0.06) |
| Expect higher interest rate                  | 0.0377                                    | (0.80)  | 0.0260  | (1.29)  | 0.0241                                    | (1.21)  | 0.0221  | (1.09)  | 0.0727                   | (1.36)  | 0.0260   | (0.97)  |
| Distance from nearest city/town centre       |   |         |   |         |   |         | -0.000796*                                      | (-1.85) |                          |         |  |         |
| Market value of housing assets               |   |         |   |         |   |         | -0.0000349                                      | (-0.00) |                          |         |  |         |
| Market value of vehicles                     |   |         |   |         |   |         | -0.0998   | (-1.62) |                          |         |  |         |
| Demand deposit                               |   |         |   |         |   |         | -0.000224                                       | (-0.00) |                          |         |  |         |
| Term deposit                                 |   |         |   |         |   |         | -0.0583   | (-0.45) |                          |         |  |         |
| Market value of shares                       |   |         |   |         |   |         | -0.0637   | (-0.78) |                          |         |  |         |
|  | Controlled                                |         | Controlled  |         | Controlled                                |         | Controlled                                      |         | Controlled               |         | Controlled   |         |
| Constant                                     | 1.548*                                    | (1.85)  | 2.807***  | (12.70) | 2.800***                                  | (13.00) | 2.800***  | (12.73) |                          |         |  |         |
| Constant-cut1                                |   |         |   |         |   |         |   |         | -2.608***                | (-4.39) | -0.913***  | (-2.97) |
| Constant-cut2                                |   |         |   |         |   |         |   |         | -0.737                   | (-1.29) | -0.147   | (-0.49) |
| Constant-cut3                                |   |         |   |         |   |         |   |         | 1.790***                 | (3.15)  | 1.116***   | (3.82)  |
| Constant-cut4                                |   |         |   |         |   |         |   |         | 4.329***                 | (7.55)  | 2.480***   | (8.40)  |
| N  | 3186                                      |         | 3231  |         | 3214                                      |         | 3217  |         | 3231                     |         | 4147   |         |

IV relevance and validity tests

|  |         |         |        |         |
|--|---------|---------|--------|---------|
| Endogeneity test: Durbin-Wu-Hausman    | 0.00001 |         |        |         |
| F test (p-value)                       |         |         |        |         |
| Underidentification test: Anderson     | 0.0316  |         | 0.0000 |         |
| canon. corr. LM statistic (p-value)    |         |         |        |         |
| Weak identification test: Cragg-Donald | 4.578   | (16.38) | 8.621  | (11.29) |
| Wald F statistic (10% critical value)  |         |         |        |         |

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*t* statistics in parentheses for OLS and TSLS regressions; *z* statistics in parentheses for logit regressions  
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$