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Housing conditions and life satisfaction in urban China

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ABSTRACT

Housing is closely related to people's daily life. In the past three decades, China's real estate market has experienced significant rapid development. People pay more attention, not only to the market value of housing itself, but also to the subjective or non-market value of life satisfaction brought about by owning a house. This paper aims to investigate how housing conditions affect individual life satisfaction in urban China, focusing on both housing satisfaction and overall happiness, using the Chinese General Social Survey dataset. We divide the full sample into age groups and income groups to analyze the homogeneity of the results across society. Through the ordered probit model, the empirical results suggest all the house-related characteristics utilized in the analysis have significantly positive effects on people's housing satisfaction, however, only homeownership and house size play important roles in determining overall happiness. Further, using housing satisfaction as an explanatory variables, housing satisfaction and homeownership are both significant factors determining overall happiness. Finally, we estimate the perceived value of homeownership at approximately 4.5 times individual income.

1. Introduction

Over the last three decades, the Chinese economy and housing market have seen rapid and sustained development. After the housing reform in 1998, the Chinese housing market has changed from a government-funded and government-run welfare housing system to a market-oriented commercial housing system. Housing has been considered one of the basic requirements for daily living and the single biggest cost factor for most individuals and households. Official statistics in China show a doubling of housing prices between 2007 and 2014 (Chivakul, Lam, Liu, Maliszewski, & Schipke, 2015), but a real annual price growth of 13.1% in the top Chinese cities between 2003 and 2013 (Fang, Gu, Xiong, and Zhou (2015). Soaring house prices and growing housing inequality have attracted the attention of many Chinese people, not only to the market value of housing itself but also to the non-market value of life satisfaction brought by owning a house (Piekałkiewicz, 2017). As Florida, Mellander, and Rentfrow (2013) claimed, people might expect to be happier in places where housing is more available, less expensive, and more affordable. One of the key objectives of housing policies is to improve individual life satisfaction (Clapham, 2010). For these policies to be successful, a good understanding of the determinants of overall life satisfaction is required, and in particular of how housing impacts upon overall satisfaction.

This study contributes to this goal by examining how housing conditions affect people's housing satisfaction and their overall satisfaction in urban China. The existing literature on overall satisfaction in China is relatively limited and mainly focuses on the determinants of general satisfaction, rather than the impact of specific housing conditions. Contemporary China is an interesting case study for this topic, since it has experienced rapid and sustained economic growth for the last three decades, as has the Chinese housing market. Housing is an item on which Chinese people spend a great deal of thought, effort, and financial resources, owing to the long tradition of preferring to live and work in peace and contentment ("*An Ju Le Ye*" in Chinese).

We use the 2006 Chinese General Social Survey (CGSS)[1] data with the ordered probit model to estimate the impact of housing characteristics on individual overall satisfaction. Our findings reveal that housing characteristics affect different groups of people differently. Generally speaking, housing-related conditions impact upon individual housing satisfaction more directly and significantly than upon overall

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[1] CGSS is conducted cooperatively by the Sociology Department of Renmin University of China and the Survey Research Centre of Hong Kong University of Science and Technology. Although there have been more recent CGSS waves, such as the 2008, 2010 and 2013 surveys, the 2006 wave is the only one so far which permits analysis of housing satisfaction and contains the questionnaires about housing conditions and facilities.

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happiness. Though housing satisfaction plays an important role in determining general happiness, individual socioeconomic features are still more significant. Finally, our money equivalent analysis findings support the view that the poorer the people in a household, the easier it is to increase their happiness.

Our study differs from the existing literature in several ways. Firstly, unlike previous researchers, we examine the impact of housing conditions, not only on overall satisfaction, but also on housing satisfaction. Secondly, existing research tends to focus on the role of housing facilities in determining residential satisfaction at the level of a specific city or region. Our study extends this to a nationwide investigation across urban China. Thirdly, we examine the effects of housing conditions on different groups of people, defined by age and income, enabling our study to provide more specific conclusions for policymakers. This has been done in the literature to some extent, but not at the same level of detail as our analysis. Finally, and for the first time in the literature as far as we are aware, we use a monetary equivalent analysis to estimate the monetary value of an incremental one square meter of house size.

Throughout the paper, we use the term satisfaction to cover concepts in the literature that are referred to as wellbeing and happiness. We also refer to houses as a generic housing concept, even though many people live in apartments.

2. Literature review

Empirical studies on the determinants of satisfaction have increased worldwide in recent years. A number of studies focus on the correlation between individuals' overall happiness or quality of life and housing satisfaction and conditions. Other studies have examined the impact of homeownership on overall happiness and particularly housing satisfaction. Generally, most studies conclude that housing types and characteristics significantly impact upon residential satisfaction, but may question their impact on overall satisfaction. More generally, Dolan, Peasgood, and White's (2008) review of the determinants of overall satisfaction suggests several major factors commonly studied by previous researchers[2] and reveal a U-shaped relationship with age and satisfaction,[3] that married people are more satisfied. Satisfaction also increases with education and income, either relative or absolute (Cullis, Hudson, & Jones, 2011; Orviska, Caplanova, & Hudson, 2014).

Some studies focus on the housing-related factors of overall satisfaction, grounded on the premise that housing satisfaction and conditions are important factors in an individuals' overall happiness or quality of life. For example, Kahlmeier, Schindler, Grize, and Braun-Fahrländer (2001) with respect to the northwestern region of Switzerland, show that an improvement in perceived housing environmental quality, broadly defined to include, e.g., relationships with neighbors, significantly contributes to an increase in overall happiness. Oswald, Wahl, Mollenkopf, and Schilling (2003) conclude that housing conditions play an important role in life satisfaction for elderly people in two rural regions of Germany. Elsinga and Hoekstra (2005) and Diaz-Serrano (2009) examine the effects of homeownership on overall happiness as well as more specifically on housing satisfaction. Nakazato, Schimmack, and Oishi (2011) find little influence of changes in housing on overall satisfaction, but do find a substantial impact on housing satisfaction. They also find housing satisfaction to be more stable than overall satisfaction. More recently, Azimi and Esmaeilzadeh (2017) find that housing types and characteristics significantly impact upon residential satisfaction in Tabriz in Iran.

Most studies have focused on developed countries, with only a limited literature on housing satisfaction and overall satisfaction in China. However that is beginning to change. Ji, Xu, and Rich (2002) use the 1993 China Housing Survey in Shanghai and Tianjin to explore the determinants of family overall happiness among married people in urban China. They find that family relationships, as reflected by frequent contact with parents and satisfaction with relationships with relatives, are significant determinants of family overall happiness, indicating the importance of Chinese filial norms that favor the family over individualism. The 2002 Chinese Household Income Project data has also been used to comprehensively investigate the determinants of satisfaction for rural-urban migrants, the rural population, and urban citizens in China (Knight & Gunatilaka, 2010, 2011; Knight, Song, & Gunatilaka, 2009). In general, age has a U-shaped relationship with happiness, females are happier than males, married people are happier than the divorced and widowed population, good health and income positively affect overall happiness, and unemployment lowers people's life satisfaction. In many respects these conclusions are consistent with those of studies in developed countries. Smyth, Nielsen, and Zhai (2010) and Nielsen, Smyth, and Zhai (2010) use the Personal Wellbeing Index to analyze the happiness of the urban population and off-farm migrants, respectively, in China and arrive at similar conclusions with respect to the impacts of gender, age, and income, as do Wang and VanderWeele (2011), although they do not find education to be significant. Chyi and Mao (2012) focus on the elderly Chinese and find that good health and living with grandchildren have a positive impact on wellbeing, although living with their children has a negative impact.

More recently, several scholars have started to pay attention to the relationship between housing-related features and life satisfaction in China. Hu (2013) finds that homeownership, particularly for women, strongly and positively affects both housing satisfaction and overall happiness in urban China. Cheng, King, Smyth, and Wang (2016) and Huang, Du, and Yu (2015) find similar results, again emphasizing the greater impact on women. Huang et al. (2015) suggests that the impact of home ownership may be due to homeowners' higher sense of belonging from greater participation in social affairs and greater access to education at a nearby school for their children. Besides homeownership, Ren and Folmer (2017) find that housing quality, community type, and a "*Hukou*"[4] also positively impact on residential satisfaction. The existing literature has also examined the impact of housing facilities on housing satisfaction, but only at the city level. For instance, Tao, Wong, and Hui (2014) and Lin and Li (2017) investigate the significant role of housing conditions in residential satisfaction for migrants in Shenzhen and Wenzhou, respectively. Whilst for Beijing, Wang and Wang (2016) conclude that home and neighborhood activities significantly affect residential satisfaction.

Some studies focus on the housing-related factors related to overall satisfaction but they tend to lack a theoretical basis. Thus, to fill this gap in the literature, in the next section we specify a theoretical model that includes the market and non-market values of homeownership.

3. Model

We present a random utility model used based on the work of Han (2010). There are two commodities: housing and non-housing goods. x denotes a vector of quantities of non-housing goods, j represents housing alternatives, and, where B represents the housing alternatives open to individual i. $U_i^*(x,j)$ denotes the utility for i, who faces a budget constraint in the form $px + w_j \leq y_i$. p is the vector of prices for non-housing goods, w_j is the price for housing j, and y_i is i's income. The decision making process takes place in two stages. In the first stage, utility is maximized with respect to non-housing goods consumption,

[2] These categories include seven broad headings: (1) income; (2) personal characteristics; (3) socially developed characteristics; (4) how we spend our time; (5) attitudes and beliefs towards self/others/life; (6) relationships; and (7) the wider economic, social, and political environment.

[3] Diaz-Serrano (2009) finds an inverted-U shaped impact of age on housing satisfaction.

[4] In China's special Household Registration System, migrants without the official transformation of household registration (*Hukou*) are defined as a "floating" population and usually excluded from the urban population in the official statistical survey and census in China.

given that housing alternative j is chosen. $\widetilde{U}_{ij}$ represents the conditional indirect utility:

$$\widetilde{U}_{ij} = max_x\, U_i^*(x,j), j \in B;\quad s.\,t.\, px \le y_i - w_j \tag{1}$$

We assume this to be of the form:

$$\widetilde{U}_{ij} = v(p, y_i - w_j, \mu_{ik} + \epsilon_{ijk}), j \in B \tag{2}$$

v(.) is a convex function common to all agents. It is assumed that $\frac{\partial v}{\partial p} < 0$ and $\frac{\partial v}{\partial y_i - w_j} > 0$. $y_i - w_j$ is income net of housing expenditure. μ_{ik} is the value to i of housing alternative j, in a particular location k, which is one of K locations. ϵ_{ijk} is a random component reflecting the unobservable heterogenity across individuals and housing alternatives.

By utilizing the property that v(.) is homogeneous of degree zero in prices of non-housing/housing goods and individual income, (2) can be written as

$$\widetilde{U}_{ij} = v\left(\frac{p}{y_i}, 1 - \frac{w_j}{y_i}, \mu_{ik} + \epsilon_{ijk}\right) \tag{3}$$

Applying the first order approximation of a Taylor series expansion around the point (x_{i0}, y_{i0}, z_{i0}), gives

$$\widetilde{U}_{ij} = v(x_{i0}, y_{i0,} z_{i0,}) + \gamma\left(\frac{p}{y_i} - x_{i0}\right) + \theta\left(1 - \frac{w_j}{y_i} - y_{i0}\right) + \varphi(\mu_{ik} - z_{i0}) + \varphi\epsilon_{ijk} \tag{4}$$

Utility is only an ordinal measure and hence, can be rescaled by normalizing around $\varphi = 1$, and subtracting $v(x_{i0}, y_{i0,} z_{i0}) + \gamma\left(\frac{p}{y_i} - x_{i0}\right) + \theta(1 - y_{i0}) - z_{i0,}$ giving

$$U_{ij} = -\theta\frac{w_{jk}}{y_i} + \mu_{ik} + \epsilon_{ijk}, \tag{5}$$

U_{ij} is a monotonic linear transformation of the utility term of $\widetilde{U}_{ij}$ and $\frac{w_{jk}}{y_i}$ measures the monthly cost of dwelling j relative to i's income. μ_{ik} denotes the value to i of housing alternative j. It is, in itself, made up of several components that relate to the characteristics of the dwelling, including the number of rooms, room size, room quality, the existence of a garden and whether the individual owns the house. The individual chooses the combination that maximizes U_{ij} in (5). For a given individual, an increase in μ_{ik} probably comes at the cost of increased payment for housing w_{jk} and reduced net income. This situation would mean that for identical individuals, the one in the better housing should not be noticeably better off. However, two individuals with similar incomes and families may choose different dwelling types with different characteristics, as w_{jk} and μ_{ik} may vary by locality (e.g., from town to town).

4. Data source and description

We use the dataset from the 2006 CGSS, a nationwide comprehensive social survey exploring the current life situations of China's citizens. The 2006 wave of the CGSS survey applied a four-phase stratified sampling approach to identifying the sampled households, at the levels of county (district), town (street), village (neighborhood committee) and household. The interviewees, who had stayed or would stay in the household for more than one week, were selected stochastically among household members aged between 18 and 69. The data contains a total of 6013 urban households in 28 provinces, municipalities, and autonomous regions of China.[5] Our sample uses 4442 valid answers from the 6013 urban questionnaires, once we have excluded those with missing. or otherwise invalid, answers.

The 2006 CGSS urban household questionnaire includes information on personal characteristics of household members, especially the respondents, such as their gender, age, ethnic group, education, religion, and employment status. The survey also contains data on general household characteristics, such as marital status, family size, income, social activities, and living standards. The project also asked the interviewees about their housing conditions. The questions included homeownership status (e.g., whether the individual rents or owns the house), housing conditions (e.g., structure/usable areas of the house, number of bedrooms, and existence of a living room or bathroom), and housing type (shanty town, affordable housing, commodity housing,[6] housing units purchased by individuals from their work units, and other types).

In the self-evaluation section about the individual's overall happiness, two life satisfaction indicators are of interest, housing satisfaction and overall happiness. Personal housing satisfaction is documented as the response to the following question: "*Are you satisfied with your current housing situation?*" with possible responses ranging from (*1*) *very unsatisfied*, (*2*) *unsatisfied*, (*3*) *satisfied*, (*4*) *very satisfied*, and (*5*) *unknown*. The individual overall satisfaction assessment is based on a 5-point ranking, which is (*1*) *very unhappy*, (*2*) *unhappy*, (*3*) *neutral*, (*4*) *happy*, and (*5*) *very happy*.

From Table 1, we can see that the homeownership rate in urban China is 74.11%, which is relatively high compared to those in *developed* countries, reflecting the traditional preference of Chinese people for owning houses as opposed to renting them (Chien, 2010; Wang, 2011). Under the marketization and commercialization of the Chinese housing market, the welfare housing system has become less important and most people now need to purchase commodity houses from the housing market. Only a few middle- or low-income individuals can purchase or rent affordable houses[7] from the government. Therefore, the portion of commercial houses is significantly larger than the portion of affordable houses for all groups of people. In addition, younger people in general will have more recently acquired their house than older people, which means they are more likely to have bought commodity houses in recent years than previous generations. Thus younger people (26.52%) own more commercial houses[8] than elderly people (21.47%). Rich people (30.06%) also own more commercial houses than poor people (18.73%), which is as we would expect. With respect to other housing conditions, 81.47% of houses have living rooms and 83.16% of houses have bathrooms, with younger and richer groups of people having higher percentages of living rooms and bathrooms than the older or poorer groups of people.

5. Methodology

Because the two happiness indicators (housing satisfaction and overall happiness) used in this study are ordinal variables, we use the ordered probit model to investigate the effects of various determinants on life satisfaction:

$$y_i^* = \alpha + \beta_i X_i + \varepsilon \tag{6}$$

In our model, y_i^* denotes individual housing satisfaction or overall happiness. In line with the relevant literature which we reviewed, the vector X includes three major categories of explanatory variables: individual characteristics, householder characteristics, and housing-related features.

As presented in Table 1, the variables for individual characteristics include age, gender, marital status, education level, self-rated health

[5] There are 31 provinces in mainland China. The three missing provinces in the survey are Qinghai, Ningxia, and Tibet. The omission of these three provinces does not affect the nationwide representativeness of the survey, as the population in these regions only accounts for a very small proportion of the population of the whole nation.

[6] Commodity or commercial houses are built by property developers and sold through the housing market rather than through the work unit allocation system.

[7] The price of affordable housing is fixed by the local government, taking into account local incomes and development costs.

[8] In the 2006 CGSS categories, "commercial houses" include two types: ordinary commodity house and high-grade commercial house or villa house.

Table 1
Summary of statistical features of relevant variables.

Variables	Total	By age		By income (yuan)	
		Young (≤42)	Old (> 42)	Low (≤10,000)	High (> 10,000)
Subjective well-being indicators					
Housing satisfaction (%)					
Very unsatisfied	11.21	11.58	10.85	11.74	10.60
Unsatisfied	35.64	37.83	33.48	37.38	33.61
Satisfied	45.61	42.87	48.30	43.42	48.51
Very satisfied	7.54	7.72	7.37	7.46	7.64
Overall happiness (%)					
Very unhappy	0.97	0.77	1.16	1.34	0.54
Unhappy	5.67	3.95	7.37	8.21	2.72
Neutral	45.81	43.60	47.99	49.96	41.00
Happy	41.83	45.05	38.66	35.21	49.51
Very happy	5.72	6.63	4.82	5.28	6.23
Individual characteristics					
Age (mean)	44	32	55	45	41
Gender (%)					
Male	48.65	49.64	47.68	39.15	59.68
Female	51.35	50.36	52.32	60.85	40.32
Marital status (%)					
Married	80.44	72.75	87.99	80.93	79.86
Unmarried[a]	19.56	27.25	12.01	19.07	20.14
Education level (%)					
Low level of education	16.34	6.40	26.12	25.15	6.13
Mid-level of education[b]	65.7	67.35	64.06	67.35	63.76
High level of education	17.96	26.25	9.82	7.50	30.11
Self-rated health status (%)					
Very poor	2.61	1.32	3.88	3.52	1.56
Poor	19.56	12.13	26.88	23.47	15.03
Good	60.45	63.62	57.32	57.96	63.33
Very good	17.38	22.93	11.92	15.05	20.09
Job status (%)					
Employed	59.57	82.88	36.65	45.60	75.78
Unemployed[c]	40.43	17.12	63.35	54.40	24.22
Householder characteristics					
Householder income (mean) (yuan)	14,204	16,745	11,706	6175	23,520
Homeownership (%)					
Homeownership[d]	74.11	67.03	81.07	76.87	70.91
No homeownership	25.89	32.97	18.93	23.13	29.09
Housing-related characteristics					
House size (mean) (m^2)	71.99	73.03	70.96	71.64	72.39
Total number of rooms (mean)	3.86	3.87	3.84	3.80	3.92
Number of bedrooms (mean)	2.21	2.19	2.22	2.21	2.20
Number of living rooms (mean)	0.93	0.95	0.92	0.90	0.97
Have living rooms (%)	81.47	83.47	79.51	79.97	83.22
Number of bathrooms (mean)	0.89	0.90	0.87	0.82	0.96
Have bathrooms (%)	83.16	84.65	81.70	78.33	88.76
House type (%)					
Affordable housing	13.85	14.67	13.04	12.78	15.08
Commercial housing[e]	23.98	26.52	21.47	18.73	30.06
Others[f]	62.17	58.81	65.49	68.48	54.86
Sample size	4442	2202	2240	2386	2056

status, and job status. Because age might have a nonlinear relationship with people's happiness, both age and age squared are included in the model. Health status is based on a 4-point scale measurement, ranging from "very poor" to "very good". Following Diaz-Serrano (2009), we also include homeownership and house size in the regression, together with the independent variables of housing conditions, such as the number of bedrooms, having a living room, and having a bathroom. Hu (2013), for example, finds that people living in commercial houses have a higher level of housing satisfaction than people staying in affordable houses. Hence, house types are included in the model as dummy variables, with "affordable housing" as the default group.

Three models are included. The first two test the effects of these determinants on people's housing satisfaction and householders' overall happiness respectively, and the third explains individual overall happiness based on the same independent variables, but includes housing satisfaction as an additional explanatory variable. We also divide the full sample into two groups by age (young/old) and income (rich/poor) to test the different effects of housing conditions on different groups of people, which is a little unusual in this type of study. A Chow test is used to determine the significance of these divisions. We also calculate the monetary equivalent value of housing conditions, based on measuring the impact of one additional square meter of a house on life satisfaction, controlling for a certain level of annual income. This then produces a monetary value for homeownership.

Various robustness checks are employed, firstly by omitting some variables with high correlation coefficients, and secondly transforming the ordered choice dependent variable into a 0–1 binary variable. Additionally, housing satisfaction may be correlated with the error term in the life satisfaction equation, because some people may be more easily satisfied with both their life and their house. That is, both equations contain a missing variable, which we might term "optimism". In both equations, this variable forms part of the error term. In the regression for overall satisfaction, housing satisfaction includes optimism and its significance will then reflect both the impact of housing satisfaction and optimism on overall satisfaction. Thus, a problem arises because the stochastic component of housing satisfaction is correlated with the stochastic element of overall satisfaction. To resolve this potential endogeneity problem, we need to remove the stochastic element from housing satisfaction by generating the predicted values from the housing satisfaction equation. These predicted values are based on both socioeconomic characteristics that are common to both equations and housing characteristics, which are independent of optimism, and thus, can help overcome the problem of endogeneity. Then, as in the Ramsey regression equation specification error test (RESET), the squared and cubed terms of predicted housing satisfaction are generated and added to the regression. This RESET augmented equation is then used to derive the predicted values of housing satisfaction.[9]

To analyze the different effects of housing characteristics between groups, we divide the full sample by both age and by income. The age boundary is 42, which enables us to consider those aged 42 or less as young and those over this age as old, and the income boundary is 10,000 yuan/year. Both roughly divide the sample into two equal halves. We also employ a monetary equivalent analysis to equate a set of housing characteristics to a specific level of income. If the regression coefficient on one of the housing characteristic is α and the coefficient on the log of annual income β, then one more unit of the housing characteristic increases happiness by α unit. However, an α unit increase of happiness can also be caused by an α/β unit increase in the log of income. That is, a one-unit increase in the housing characteristic increases happiness by the same amount as an increase in the log of income of α/β. For a given level of initial income (y*), the log of income increases to, $\ln(y^*) + \alpha/\beta$ and the annual income after the increase is $e^{\ln(y^*)} + \alpha/\beta$, which is equal to $y^* e^{\alpha/\beta}$. Thus the increase in income is equal to $y^*(e^{\alpha/\beta} - 1)$ or $(y^* e^{\alpha/\beta} - y^*)$. Specifically, one more unit of the housing condition can make people as happy as an increase in income of $y^*(e^{\alpha/\beta} - 1)$.

[9] Let $\hat{y}$ denote the fitted value from Equation 6, and the expanded equation is $y_i^* = \alpha + \beta_i X_i + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + \varepsilon$. Then, the predicted value of housing satisfaction from the expanded equation should be used in the overall life satisfaction regression.

Table 2
Descriptive results of the relationship between individual subjective well-being and housing conditions.

Variables	Housing satisfaction (mean)	Overall satisfaction (mean)
Homeownership		
Homeownership	2.629	3.513
No homeownership	2.110	3.295
House type		
Affordable housing	2.418	3.507
Commercial housing	2.570	3.543
Others	2.483	3.412
House size (m^2)		
0–42	2.020	3.260
42–57	2.407	3.378
57–69	2.501	3.511
69–90	2.672	3.551
> 90	2.865	3.582
Number of bedrooms		
1	2.120	3.305
2	2.497	3.458
3	2.745	3.565
4	2.829	3.566
5	2.833	3.405
6	2.935	3.630
7	2.800	4.000
8	3.000	3.632
9	3.067	3.733
Living rooms		
Have living rooms	2.556	3.480
Does not have living rooms	2.226	3.355
Bathrooms		
Have bathrooms	2.552	3.481
Does not have bathrooms	2.213	3.338

Notes: This table shows the average response of people with different housing characteristics. A higher score indicates greater satisfaction or overall happiness.

6. Empirical results

6.1. Descriptive results

In Table 2, we show the average housing and overall satisfaction levels for different housing characteristics such as homeownership, housing type, house size, number of bedrooms, and existence of living rooms or bathrooms. The average housing and overall satisfaction for homeowners are both higher than for non-homeowners. Moreover, citizens who live in commercial housing also have higher average levels for both indicators than those who live in the lower-standard housing, which is the economically affordable housing. In addition, there is substantial evidence that the percentage of satisfied people grows with increasing house size and the number of bedrooms. For instance, individuals living in housing larger than 90 m^2 are characterized by a higher average housing satisfaction and overall satisfaction compared to those living in housing smaller than 42 m^2. Similarly, for those living in housing with nine bedrooms, the levels are significantly higher than for those living in housing with one bedroom. Furthermore, people living in housing with living rooms or bathrooms are more satisfied in terms of both indicators than people living in housing without living rooms or bathrooms. Of course, these differences could also reflect differences in income or the number of people living in a house. As correlation does not imply causation, we examine the causal impacts with the ordered probit model to further investigate the impact of these housing-related characteristics on people's housing and life satisfaction.

6.2. Effects on housing satisfaction

As shown in Table 3, most of the explanatory variables we use (individual, household, and housing characteristics) have significant impacts on housing satisfaction for the full sample, except for gender, marital status, education level, and job status. As the literature suggests (Hu, 2013; Knight et al., 2009; Knight & Gunatilaka, 2011; Wang & VanderWeele, 2011), age is a significant factor in determining housing satisfaction. There is a U-shaped relationship between age and individual housing satisfaction, as the coefficients of age and age square are −0.0328 and 0.00044 respectively, reaching the minimum point at approximately 37.27 years.[10] A U-shaped relationship with age is common with satisfaction per se. Our results suggest that housing satisfaction declines with age for the people who are younger than 37, above which housing satisfaction increases with age. Typically, this is the age that children begin leaving the home, which may increase the number of rooms per person, thus increasing housing satisfaction. Similar to other studies in China (Hu, 2013), health significantly and positively impacts upon housing satisfaction.

Both householder income and homeownership for the full sample are significant at the 1% level. In line with other happiness studies (Diaz-Serrano, 2009; Hu, 2013), householder income is an important determinant of housing satisfaction. To some extent, higher income means higher affordability for better houses and better furnishings, decoration, and housing amenities. Also, the deep-rooted ideal of owning houses among Chinese people explains the significance of homeownership. However, homeownership is also a form of wealth and, as suggested by others, may increase involvement in the community. All housing characteristics, including house size, number of bedrooms, existence of living rooms or bathrooms, and house type, significantly and positively affect individual housing satisfaction. Specifically compared with people living in commercial and other houses, those living in economically affordable houses show a lower housing satisfaction. Wu, Gyourko, and Deng (2012) argued that a possible explanation for such results is the relative distance of economically affordable houses from city centers and their poor infrastructure. However, there may also be other reasons that are linked, for example, to housing quality.

As a robustness check, the explanatory variables of job status, number of bedrooms, and having bathrooms were excluded, and the results were similar to the original estimations. A second robustness check was performed by transforming the dependent variable into a binary one and estimating the regression by the probit model. This step changes the impact of house type, which is no longer significant. Of course, moving from an ordered to a binary variable entails a loss of information, and this result suggests that in this case, this information is important.

The results from dividing the sample into different age and income groups are also shown in Table 3. Householder income is no longer significant for older people, while homeownership is still an influential factor for the housing satisfaction of both groups. Interestingly, all housing-related characteristics are significant for old people's housing, but only house size and number of bedrooms are significant for young people's housing satisfaction. In Table 3, among the groups of low-income and high-income householders, homeownership and house size are significant at the 1% level. Apart from having living rooms, the number of bedrooms and having bathrooms significantly impact upon low-income people's satisfaction, but not so much high-income people's satisfaction. In contrast, having living rooms affects rich people's satisfaction more significantly than poor people's satisfaction. Affordable housing, as a kind of social welfare, is mainly for the middle−/low-

[10] Suppose we have the equation $y = \alpha + \beta X + \delta X^2 + \varepsilon$; we differentiate the equation with respect to X, then we can get $dy/dx = \beta + 2\delta X$. The extreme value exists when $dy/dx = \beta + 2\delta X = 0$, then X = $-\beta/2\delta$ or $0.0328/(2 * 0.00044)$.

Table 3
Effects on housing satisfaction for total sample and for groups.

Variables	Housing satisfaction						
	Total sample			By groups			
	Total	Robustness checks		By age		By income (yuan)	
		Drop Indep. Var.	Binary Dep. Var. (0–1)	Young (≤42)	Old (> 42)	Low (≤10,000)	High (> 10,000)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Individual characteristics							
Age	−0.033(3.46)***	−0.034(3.61)***	−0.028(2.42)**	−0.56(1.37)	0.033(0.72)	−0.34(2.73)***	−0.033(2.20)**
Age square	0.0004(4.15)***	0.0005(4.47)***	0.0004(3.30)***	0.001(1.13)	−0.0002(0.41)	0.0005(3.31)***	0.0005(2.63)***
Gender (default group: male)							
Female	0.019(0.56)	0.029(0.84)	0.021(0.51)	0.054(1.12)	−0.014(0.27)	−0.009(0.20)	0.058(1.13)
Marital status (default group: unmarried)							
Married	0.063(1.30)	0.065(1.34)	0.033(0.56)	0.079(1.13)	0.095(1.29)	0.016(0.25)	0.122(1.69)*
Education level (default group: lowlevel of education)							
Mid-level education	−0.050(−0.99)	−0.042(0.83)	−0.010(0.17)	−0.048(0.48)	−0.056(0.92)	−0.029(0.48)	−0.119(1.10)
High level of education	0.066(1.00)	0.081(1.23)	0.131(1.65)*	0.101(0.91)	0.080(0.08)	0.059(0.57)	0.011(0.10)
Self-rated health status	0.448(17.29)***	0.445(17.20)***	0.382(12.21)***	0.387(10.10)***	0.504(14.21)***	0.510(14.77)***	0.371(9.37)***
Job status (default group: unemployed)							
Employed	0.019(0.42)	–	0.004(0.08)	0.007(0.10)	0.016(0.26)	0.039(0.71)	−0.040(0.49)
Householder characteristics							
Log of householder income (yuan)	0.058(2.63)***	0.065(3.09)***	0.078(2.93)***	0.088(2.86)***	0.025(0.77)	0.072(1.98)**	0.095(1.82)*
Homeownership (default group: no homeownership)							
Homeownership	0.569(13.74)***	0.603(14.75)***	0.516(10.46)***	0.625(11.26)***	0.487(7.65)***	0.561(9.61)***	0.568(9.47)***
Housing-related characteristics							
House size (m^2)	0.004(7.31)***	0.005(12.48)***	0.006(7.93)***	0.004(5.64)***	0.003(4.58)***	0.004(5.71)***	0.004(4.78)***
Number of bedrooms	0.080(4.00)***	–	0.111(4.13)***	0.071(2.39)**	0.090(3.27)***	0.095(3.60)***	0.050(1.62)
Have living rooms	0.172(3.33)***	0.239(5.32)***	0.149(2.36)**	0.116(1.52)	0.220(3.09)***	0.059(0.85)	0.317(4.04)***
Have bathrooms	0.174(3.17)***	–	0.232(3.48)***	0.027(0.34)	0.306(4.06)***	0.197(2.87)***	0.179(1.91)*
House type (default group: affordable housing)							
Commercial housing	0.138(2.44)**	0.138(2.44)**	0.025(0.38)	0.109(1.42)	0.177(2.11)**	0.212(2.56)**	0.072(0.92)
Others	0.124(2.47)**	0.106(2.13)**	0.007(0.11)	0.085(1.22)	0.167(2.29)**	0.198(2.81)***	0.054(0.75)
Number of observations	4442	4442	4442	2202	2240	2386	2056

Notes: ( ) denotes the t-statistics of the respective coefficients, ***/**/* indicates significance at the 1%/5%/10% levels.

income population, and richer people need to purchase commercial apartments from the housing market. This situation can explain why housing type does not significantly influence rich people's housing satisfaction.

6.3. Effects on overall happiness

Table 4 illustrates the effects of the various variables on overall satisfaction. Both annual income and homeownership are very significant in determining overall satisfaction. Unsurprisingly, housing-related characteristics impact upon people's overall satisfaction less than their housing satisfaction. The robustness checks done by dropping highly correlated variables does not substantially change the results. Most individual characteristics are significant and most housing-related factors are not. However, making the dependent variable binary and using binomial probit changes the impact of several housing-related determinants, with having bathrooms and other house types both now significant at the 5% level.

Differentiating the sample by age, the individual characteristics—gender, marital status, education level, and self-rated health status—significantly impact upon overall satisfaction. However, age itself only affects the satisfaction of those under 42. Again, there is no evidence that job status affects individual overall satisfaction. Income and homeownership do strongly influence the satisfaction of both age groups at the 1% level of significance. However, the only significant housing-related features for old and young people's satisfaction are respectively house size and having bathrooms.

Dividing the sample by income, individual characteristics, apart from job status, strongly impact upon both rich and poor people's overall satisfaction. Job status is however significant for high-income populations. As mentioned above, housing-related characteristics tend to be less significant for overall satisfaction, and only house size affects low-income householders at the 1% level of significance, and having living rooms affects high-income householders at the 5% level. Furthermore, having bathrooms marginally impacts on rich people's satisfaction at the 10% level.

The stronger effects of individual characteristics and the weaker impact of housing conditions on overall satisfaction indicate that people's overall life satisfaction is more related to individual situations. Housing conditions affect housing satisfaction more than overall satisfaction. Even so, homeownership is always powerful in explaining both indicators for all groups of people. In addition, we can see that some housing characteristics do impact on the satisfaction of different groups of people, but in different ways.

6.4. Effects on overall happiness of including housing satisfaction

As Table 5 shows, after adding housing satisfaction as an explanatory variable, it becomes significant at the 1% level in explaining overall satisfaction for all groups of the population, regardless of their age or income level. From the perspective of all respondents, Table 5 shows similar findings to Table 4, apart from job status. The other

Table 4
Effects on overall happiness for total sample and for groups.

Variables	Overall happiness						
	Total sample			By groups			
	Total	Robustness checks		By age		By income (yuan)	
		Drop Indep. Var.	Binary Dep. Var. (0–1)	Young (≤42)	Old (> 42)	Low (≤10,000)	High (> 10,000)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Individual characteristics							
Age	−0.096(9.94)***	−0.096(10.04)***	−0.103(8.94)***	−0.138(3.31)***	0.053(1.14)	−0.098(7.80)***	−0.098(6.38)***
Age square	0.001(9.56)***	0.001(9.82)***	0.001(8.68)***	0.002(2.45)**	−0.0003(0.75)	0.001(7.32)***	0.001(6.42)***
Female	0.174(4.97)***	0.171(4.94)***	0.160(3.85)***	0.104(2.11)**	0.249(4.90)***	0.163(3.42)***	0.216(4.09)***
Married	0.543(11.03)***	0.547(11.12)***	0.569(9.44)***	0.594(8.28)***	0.569(7.63)***	0.527(7.95)***	0.568(7.58)***
Mid-level education	0.195(3.82)***	0.191(3.75)***	0.202(3.30)***	0.269(2.65)***	0.167(2.74)***	0.169(2.85)***	0.140(1.29)
High level of education	0.356(5.36)***	0.350(5.29)***	0.431(5.47)***	0.506(4.47)***	0.212(2.19)**	0.390(3.75)***	0.283(2.44)**
Self-rated health status	0.432(16.56)***	0.433(16.62)***	0.423(13.46)***	0.382(9.81)***	0.475(13.39)***	0.434(12.71)***	0.419(10.28)***
Employed	−0.010(0.22)	–	−0.014(0.25)	−0.101(1.43)	−0.008(0.13)	0.074(1.36)	−0.227(2.74)***
Householder characteristics							
Log of householder income (yuan)	0.199(8.91)***	0.198(9.26)***	0.223(8.35)***	0.165(5.21)***	0.235(7.16)***	0.210(5.73)***	0.154(2.88)***
Homeownership	0.340(8.16)***	0.343(8.35)***	0.344(6.97)***	0.352(6.27)***	0.314(4.93)***	0.326(5.61)***	0.364(5.94)***
Housing-related characteristics							
House size (m^2)	0.001(2.53)**	0.002(4.26)***	0.002(3.63)***	0.001(1.29)	0.002(2.43)**	0.002(2.89)***	0.001(0.79)
Number of bedrooms	0.028(1.42)	–	0.043(1.82)*	0.044(1.48)	0.013(0.49)	0.019(0.71)	0.029(0.92)
Have living rooms	0.067(1.29)	0.033(0.72)	0.112(1.80)*	0.079(1.01)	0.058(0.81)	−0.015(0.21)	0.203(2.52)**
Have bathrooms	−0.064(1.17)	–	−0.134(2.04)**	−0.165(2.01)**	0.014(0.19)	−0.019(0.28)	−0.172(1.80)*
Commercial housing	−0.013(0.23)	−0.009(0.16)	−0.013(0.19)	−0.043(0.54)	0.018(0.22)	0.044(0.53)	−0.048(0.60)
Others	−0.098(1.92)*	−0.087(1.72)*	−0.135(2.26)**	−0.107(1.51)	−0.091(1.24)	−0.084(1.19)	−0.105(1.42)
Number of observations	4442	4442	4442	2202	2240	2386	2056

Notes: ( ) denotes the t-statistics of the respective coefficients, ***/**/* indicates significance at the 1%/5%/10% levels.

Table 5
Effects on overall happiness, including housing satisfaction as an explanatory variable, for total sample and for groups.

Variables	Overall happiness						
	Total sample			By groups			
	Total	Robustness checks		By age		By income (yuan)	
		Drop Indep. Var.	Binary Dep. Var. (0–1)	Young (≤42)	Old (> 42)	Low (≤10,000)	High (> 10,000)
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Housing satisfaction	0.331(13.67)***	0.329(13.65***)	0.561(12.96)***	0.319(9.36)***	0.337(9.73)***	0.356(10.80)***	0.295(8.19)***
Individual characteristics							
Age	−0.091(9.40)***	−0.091(9.47)***	−0.100(8.61)***	−0.129(3.07)***	0.046(0.99)	−0.093(7.35)***	−0.094(6.08)***
Age square	0.001(8.86)***	0.001(9.07)***	0.001(8.16)***	0.001(2.24)**	−0.0002(0.65)	0.001(6.72)***	0.001(6.04)***
Female	0.174(4.95)***	0.169(4.86)***	0.157(3.75)***	0.096(1.94)*	0.256(5.02)***	0.169(3.54)***	0.210(3.95)***
Married	0.545(11.01)***	0.548(11.09)***	0.579(9.49)***	0.591(8.20)***	0.564(7.53)***	0.537(8.07)***	0.559(7.42)***
Mid-level education	0.210(4.09)***	0.204(3.98)***	0.217(3.49)***	0.282(2.76)***	0.183(2.99)***	0.181(3.02)***	0.162(1.48)
High level of education	0.350(5.24)***	0.341(5.12)***	0.419(5.25)***	0.493(4.34)***	0.214(2.21)**	0.386(3.69)***	0.284(2.44)**
Self-rated health status	0.350(13.01)***	0.352(13.10)***	0.357(11.13)***	0.313(7.87)***	0.382(10.36)***	0.332(9.33)***	0.360(8.66)***
Employed	−0.014(0.31)	–	−0.014(0.25)	−0.104(1.47)	−0.011(0.17)	0.068(1.24)	−0.224(2.69)***
Householder characteristics							
Log of householder income (yuan)	0.192(8.54)***	0.189(8.79)***	0.214(7.90)***	0.150(4.73)***	0.235(7.13)***	0.200(5.43)***	0.139(2.60)***
Homeownership	0.225(5.27)***	0.221(5.23)***	0.240(4.75)***	0.227(3.93)***	0.216(3.34)***	0.205(3.45)***	0.262(4.18)***
Housing-related characteristics							
House size (m^2)	0.001(1.09)	0.001(1.70)*	0.001(2.18)**	0.0001(0.20)	0.001(1.54)	0.001(1.68)	−0.00004(0.05)
Number of bedrooms	0.012(0.58)	–	0.022(0.92)	0.030(1.00)	−0.006(0.20)	−0.002(0.08)	0.019(0.61)
Have living rooms	0.031(0.59)	−0.020(0.44)	0.076(1.21)	0.055(0.70)	0.011(0.16)	−0.028(0.40)	0.141(1.74)*
Have bathrooms	−0.107(1.92)*	–	−0.182(2.72)***	−0.176(2.14)**	−0.056(0.73)	−0.068(0.98)	−0.212(2.21)**
Commercial housing	−0.041(0.71)	−0.036(0.63)	−0.014(0.20)	−0.064(0.81)	−0.016(0.19)	−0.0004(0.01)	−0.061(0.76)
Others	−0.124(2.43)**	−0.108(2.14)**	−0.136(2.25)**	−0.125(1.74)*	−0.127(1.72)*	−0.129(1.81)	−0.116(1.56)
Number of Observations	4442	4442	4442	2202	2240	2386	2056

Notes: ( ) denotes the t-statistics of the respective coefficients, ***/**/* indicates significance at the 1%/5%/10% levels.

individual characteristics (age, gender, marital status, education level, and health status) significantly affect overall happiness. Furthermore, householder income and homeownership, as always, have significantly positive effects. Additionally, in Table 5, the results of both robustness checks are in accordance with the original function. However, in the regression with a binary dependent variable, housing size and having bathrooms exhibit more significant effects on overall happiness at the 5% level.

Turning to the regressions on the different age groups, most of the individual and householder characteristics significantly affect overall satisfaction. However, age only impacts upon young people's satisfaction and job status has no explanatory power for either group. Most of the housing-related characteristics have no significant impact, apart from having bathrooms, which significantly affects young people's satisfaction. Most of the individual characteristics significantly affect the overall satisfaction of both groups of people, one exception to this is the mid-level of education, which affects only the low-income population's satisfaction. Another is job status, which strongly impacts upon the high-income group's satisfaction. Again, both income and homeownership play important roles in determining people's overall satisfaction at different income levels. In contrast, housing-related characteristics are much less important for people's overall satisfaction. The significance of homeownership indicates that it improves well-being independently of its impact on housing satisfaction. This finding may reflect a wealth effect, or alternatively, reflect citizenship.

In general, we can conclude that housing characteristics impact upon groups of people differently. The findings also show that housing-related condition variables affect individuals' housing satisfaction directly and significantly. However, overall satisfaction seems to be affected by individual characteristics more than housing conditions. Even so, housing satisfaction significantly impacts upon overall happiness, in addition to the other explanatory variables. In addition two householder characteristics, annual income and homeownership, consistently affect life satisfaction, which emphasizes the importance of both income and homeownership to people's lives in urban China.

To test the validity of the age and income divisions, we use a method similar method to the Chow test (i.e., running a regression and testing certain coefficients against zero). Table 6 shows the results and suggests that our age and income divisions are both significant at either the 5% or 10% level for all regressions.

6.5. Effects on overall happiness using the predicted value of housing satisfaction

As mentioned before, people who are satisfied with their life overall may more easily feel satisfied about their houses, because both attitudes may be affected by optimism. Thus, housing satisfaction may be correlated with the error term in the overall satisfaction regression. To resolve the potential endogeneity problem, we generate the predicted value from the housing satisfaction equation, as explained earlier. First, we take the predicted value of housing satisfaction from the full sample regression in Table 5. Then, as the Ramsey RESET suggests, add the squared and cubed terms of predicted housing satisfaction to the regression. This RESET augmented equation is then used to derive the predicted values of housing satisfaction.

Table 6
Group division tests.

Groups	Chi-square	Prob > Chi-square
Group division tests for housing satisfaction		
By Age	27.18	0.0555*
By Income	26.76	0.0618*
Group division tests for overall happiness		
By Age	34.96	0.0063***
By Income	28.77	0.0367**
Group division tests for overall happiness with housing satisfaction		
By Age	30.15	0.0360**
By Income	29.07	0.0475**

Notes: ***/**/* indicates significance at the 1%/5%/10% levels.

Table 7
Comparisons of overall happiness regressions.

Explanatory variables	Regression using the predicted value of housing satisfaction	Original regression with housing satisfaction
	Coef.	Coef. from Table 5
Housing satisfaction	0.479(2.94)***	0.331(13.67)***
Individual characteristics		
Age	−0.080(−7.28)***	−0.091(−9.40)***
Age square	0.001(6.33)***	0.001(8.86)***
Female	0.165(4.68)***	0.174(4.95)***
Married	0.514(10.23)***	0.545(11.01)***
Mid-level education	0.220(4.24)***	0.210(4.09)***
High level of education	0.325(4.83)***	0.350(5.24)***
Self-rated health status	0.218(2.82)***	0.350(13.01)***
Employed	−0.019(−0.41)	−0.014(−0.31)
Householder characteristics		
Log of householder income (yuan)	0.172(7.08)***	0.192(8.54)***
Homeownership	0.067(0.65)	0.225(5.27)***
Housing-related characteristics		
House size (m^2)	−0.0005(−0.61)	0.001(1.09)
Number of bedrooms	−0.010(−0.42)	0.012(0.58)
Have living rooms	−0.016(−0.27)	0.031(0.59)
Have bathrooms	−0.148(−2.38)**	−0.107(−1.92)*
Commercial housing	−0.080(−1.30)	−0.041(−0.71)
Others	−0.157(−2.88)***	−0.124(−2.43)**
Number of observations	4442	

Note: ( ) denotes the t-statistics of the respective coefficients, ***/**/* indicates significance at the 1%/5%/10% levels.

Table 7 compares the regression using this predicted value of housing satisfaction with the original one, and the two show quite similar results. We find that housing satisfaction, together with the other individual characteristics, apart from employment, plays an important role in determining people's overall satisfaction. With respect to housing-related features, only having bathrooms and other housing types significantly affect overall satisfaction. The only difference between the two equations is the impact of homeownership; the modified equation suggests homeownership no longer significantly influences overall happiness, independent of its impact on housing satisfaction. That finding may be because the impact of homeownership is already captured by the predicted explanatory variable of housing satisfaction. In any case, earlier regressions have shown its importance.

6.6. Monetary equivalence results

As we can see from Table 4, only one of the housing conditions, namely house size, plays a significant role in the overall satisfaction of the full sample, the old group, and the low-income group. The monetary equivalent analysis shows that an incremental one square meter of a house increases overall happiness by the same level as a certain level of annual income, which we now proceed to calculate. Table 8 displays the calculations of the money equivalent analysis with regard to increased house size, and where y* equals average income.

As indicated by the survey data, the average annual incomes of the full sample, old group, and low-income group are 14,204, 11,706 and 6175 yuan, respectively; Table 8 shows that the monetary equivalent to

Table 8
Estimating money equivalence of house size.

Money equivalent analysis	Total	Old population (> 42)	Low-income population (≤10,000)
Coefficient of house size (from Table 4)	0.001219	0.001746	0.001901
Coefficient of log of income (from Table 4)	0.199458	0.234635	0.210061
Happiness increase from one m^2 increase	0.001219	0.001746	0.001901
Happiness increased from an increase of log of income	0.0061116 (=*0.001219/0.199458*)	0.0074422 (=*0.001746/0.234635*)	0.0090517 (=*0.001901/0.210061*)
Average annual income of different groups (from Table 1)	14,204	11,706	6175
Log of average annual income	9.5612789 (=ln(*14204*))	9.3678568 (=*ln*(*11706*))	8.7282641 (=*ln*(*6175*))
Log of income after increase	9.5673904 (=*9.56127889 + 0.0061116*)	9.3752990 (=*9.3678568 + 0.0074422*)	8.7373158 (=*8.7282641 + 0.0090517*)
Income after increase	14,291.074 (=$e^{9.5673904}$)	11,793.443 (=$e^{9.3752908}$)	6231.1478 (=$e^{8.7373158}$)
Increase in income above the average value	87.074 (=*14,291.074–14,204*)	87.443 (=*11,793.443–11,706*)	56.1478 (=*6231.1478–6175*)
Money equivalent of effects of one m^2increase in house size equal to the increase in income: (yuan)	87.07	87.44	56.15

one more square meter of house size on individual overall satisfaction are 87.07, 87.44, and 56.15 yuan in income for the three groups, respectively. The second figure (87.44) is slightly more than the first (87.07), despite the old group having a lower income, as they are based on different regressions. This finding implies that one more square meter of house size increases overall happiness to the same extent as an 87 yuan increase in income for both all respondents and old people. The low-income group needs the smallest income increase (56 yuan) to reach the same level of happiness as from one more square meter on house size. Thus low-income people need a lower income increase than both the full sample and old people. This finding indicates that the overall satisfaction of low-income householders might be more easily increased with a lower absolute income increase than richer households.

We perform a similar calculation for the value of homeownership based on the full sample regression results. For someone with an average income of 14,204 yuan, homeownership is worth an extra 63,880 yuan. Given that this frees them from income payments and represents a wealth increase, this is not unreasonable. These values, of course, pertain to the yuan as it was in 2006.

7. Conclusion and implications

This study investigates how the residential environment impacts upon individual life satisfaction in urban China. The empirical results suggest that housing conditions significantly affect housing satisfaction. In addition, some housing characteristics also significantly impact upon overall satisfaction, even when other individual characteristics are included. Our results indicate the importance of house size in determining overall satisfaction, which, to an extent, is also influenced by other household characteristics. Thus, we can conclude that housing conditions impact upon overall satisfaction, in addition to housing satisfaction.

We also show that housing impacts upon overall satisfaction and housing satisfaction for different population groups in different ways. For young people, housing conditions are less important than for old people. In terms of overall happiness, house size is significant for old people but not so much for young people, and this finding indicates the need for housing mobility (i.e., for people to move houses, or at least adapt to them, as they age). In terms of income groups, particularly for housing satisfaction, there are more significant housing variables for low-income than for high-income householders. This finding may reflect the greater constraints on low-income people in getting the type of house they want.

Finally, the results of our monetary equivalent analysis indicate that one more square meter in house size causes the same increase in overall happiness as an 87.07, 87.44, and 56.15 yuan increase in annual income for the full sample, older group, and low-income group, respectively. Thus, a 40% size increase for a 50-square meter property would be worth 1740 yuan to the average person. These income equivalent differences between low income people and others suggest that poor people's overall life satisfaction is more responsive to a little more money. This finding, of course, is the basis for a redistributive tax system. In addition, we estimate the value of homeownership to an individual with an average income to be 63,880 yuan in 2006, or about 4.5 times that income. We believe this is the first time that this type of analysis has been done in the context of housing characteristics.

These findings have several important policy implications. Firstly, people's overall satisfaction can be significantly affected by housing satisfaction, which indicates the importance of housing in the daily lives of Chinese people. Housing policy can be used not just to stimulate the economy and to provide workers a place to live, but to actively promote the life satisfaction of the citizens. With China's “new-type urbanization” emphasis on a people-centered approach, the government should emphasize housing policies to maintain social stability and enhance life satisfaction. Secondly, both overall and housing satisfaction can be increased by promoting homeownership, as with previous government policies. This result is consistent with the possibility that policies to help people own a home, also increase their sense of belonging to a community. Thirdly, policy differentiation for different groups is needed, as the impacts of the determinants of life satisfaction vary. However, Table 1 shows that the rich-poor satisfaction gap is lower for housing than for overall satisfaction. This result suggests that although housing provides unequal levels of satisfaction, it may help reduce the gap in life satisfaction compared with other aspects of people's lives. Finally, the government may extend the housing policy from a homeownership scheme to a housing satisfaction scheme that aims to increase people's overall happiness and housing satisfaction through improving housing conditions. According to Shi, Chen, and Wang (2016) and Zhou and Ronald (2017), public rental housing is again being emphasized in China, and our results highlight the importance of the quality of such housing.

Further work can build on these findings by replicating the study for other countries. In particular, they can examine to what extent our findings with respect to the different preferences of the old and the young are true in other countries. Even though this study obtains findings with regard to the impact of housing conditions on individual life satisfaction, there might be other factors that are more strongly

related to housing satisfaction. However, owing to the restrictions of the CGSS survey, our model contains a limited number of indicators of housing-related features. With the development and improvement of the social survey, we can create more extensive estimates by including other typical housing variables in the model, such as apartment location and neighborhood environment. However, clearly, along with rising incomes, rising housing quality is one way in which we can expect overall satisfaction to increase over time.

[a]Single/cohabiting/separated/divorced/widowed.

[b]Junior high school/vocational high school/senior high school/technical secondary school/technical school.

[c]Unemployed but had a job before/never worked.

[d]Private house (inheritance or self-build)/homeownership (partly-owned)/homeownership (fully-owned).

[e]Ordinary commodity house/high-grade commercial housing or villa house.

[f]Shanty town/old town without development/urban village/immigrant communities/community units of industrial and mining enterprises/community units of public institutions or government institutions/others.

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