Does happiness dwell in an owner-occupied house? Homeownership and subjective well-being in urban China

Xian Zheng[a], Zi-qing Yuan[a], Xiaoling Zhang[b],*

[a] *Dept. of Economics, Jinan University, Guangzhou, China*
[b] *Dept. of Public Policy, City University of Hong Kong, Shenzhen Research Institute, City University of Hong Kong, China*

ABSTRACT

This study investigates the causal relationship between homeownership and subjective well-being based on household-level panel data collected from the China Household Finance Survey (CHFS) in 2011 and 2013. The extent to which homeownership contributes to the changes in subjective well-being is estimated, focusing on the heterogeneous effects across socioeconomic and demographic groups. Evidence from the identification strategies indicates that homeownership has a positive impact on subjective well-being. Moreover, the results are robust to different specifications and unaffected by the financial constraints faced by new homeowners. Our findings have useful implications for policymakers to stimulate homeownership rates to promote subjective well-being.

1. Introduction

The analysis of well-being is the cornerstone of neoclassical welfare economics, with abundant empirical literature concerning the determinants of self-reported happiness, life satisfaction, or subjective well-being (SWB) (Dolan, Peasgood, & White, 2008).[1] As a representative and multidimensional indicator of individual utility or welfare, SWB is determined by the fundamental aspects of life from a macroscopic perspective (Benjamin, Heffetz, Kimball, & Szembrot, 2014).

Housing satisfaction is one of the most decisive domains accounting for life cycle satisfaction (Van Praag, Frijters, & Ferrer-i-Carbonell, 2003); in the words of John Howard Payne (1781–1852), "Be it ever so humble, there is no place like home". Intuitively, homeownership exerts an indirect influence on overall life satisfaction through housing satisfaction. Previous studies mainly investigate the determinants of housing satisfaction, including housing tenure, hedonic characteristics, individual and household attributes, neighborhood conditions, and social interactions. In particular, homeownership has gained increasing attention due to its potential implications for both individuals and societies. An extensive literature provides empirical evidence supporting a positive relationship between homeownership and SWB (Diaz-Serrano, 2009; Dietz & Haurin, 2003; Guven & Sørensen, 2012; Ruprah, 2010; Stillman & Liang, 2010; Zumbro, 2014), whereas other studies report a contradictory negative or insignificant relationship

(Bucchianeri, 2011; Elsinga & Hoekstra, 2005a; Parker, Watson, & Webb, 2011).

Theoretical disputes and welfare concerns motivate our investigation of the relationship between homeownership and SWB. For decades, it was taken for granted that homeownership is related to welfare improvement due to its private and social benefits. However, homeownership is assumed to decrease SWB when the heavy financial burden of mortgages, constraints on mobility, and uncertainty of housing prices are considered. Many question whether homeownership can ultimately increase SWB in consideration of housing affordability. Therefore, it is necessary to evaluate the impact of homeownership on SWB in consideration of both benefits and potential drawbacks.

In light of this debate, we evaluate whether homeownership increases, decreases, or has no effect on SWB. An increased understanding of the relationship between homeownership and SWB will be beneficial for policymakers to develop sustainable housing policies. Furthermore, discovering the factors through which homeownership affects SWB is crucial. In this way, policymakers can advance policies and take initiatives to facilitate SWB according to an appropriate micro-mechanism. Consequently, the relationship between homeownership and SWB is an important issue in need of further research.

China's housing market provides an appealing testing ground for analyzing the homeownership-happiness puzzle for several reasons. On the one hand, from the standpoint of housing systems, China is usually considered as a home-owning society rather than a cost-rental society.

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* Corresponding author.
  E-mail address: xiaoling.zhang@cityu.edu.hk (X. Zhang).
[1] The terms "happiness," "subjective well-being," and "life satisfaction" are used interchangeably throughout the paper.

In such a setting, renting is not regarded as a good alternative to homeownership. Renting usually involves residential uncertainty or instability of individual life conditions. In particular, renters are unable to fulfill widely-accepted family values and practices (Elsinga & Hoekstra, 2005b). By contrast, the homeowners reap the benefits of social identity in marriage markets and other aspects. Accordingly, an enthusiastic preference for homeownership has been deeply rooted in Chinese tradition since ancient times. On the other hand, market-oriented reform of the welfare housing system in 1998 dramatically fueled the willingness of households to gain privatized homeownership and increased the homeownership rate (Chen & Wen, 2017). Additionally, China's housing market is substantially influenced by local governments' profit-oriented land financing activities. Along with a series of socioeconomic reforms and acceleration in urbanization, housing prices have been soaring in recent years, especially in first-tier cities. Given the high housing prices and price-to-rent ratios, unaffordability poses one of the biggest challenge in the so-called superstar cities (Chen, Hu, & Lin, 2019; Gyourko, Mayer, & Sinai, 2013). The literature concerning the homeownership-happiness puzzle in China continues to grow, and some studies question whether the overwhelming financial burden can offset the positive effects of homeownership (J. Chen & Deng, 2014; R. Chen, 2010; Cheng, King, Smyth, & Wang, 2016; Cheng & Smyth, 2015a; Hu, 2013).

The remainder of this paper is structured as follows. Section 2 presents a literature review. Section 3 provides a theoretical framework regarding the relationship between homeownership and SWB. The data sources and descriptive statistical analysis used are presented in Section 4, followed by the empirical strategy in Section 5. Section 6 reports the empirical results and robustness checks, while Section 7 summarizes and concludes the paper.

2. Literature review

2.1. General determinants of subjective well-being

Within the extensive literature examining SWB, there is a consensus that its general determinants include cultural background, social norms, economic and political status, personal achievements and characteristics, relationships, and social capital. Although research into SWB originated from developed western countries, considerable attention has been paid to recognizing what constitutes Chinese happiness, where an emerging body of literature reveals intriguing findings regarding the decisive factors of SWB (L. Chen, Zhang, Yang, & Yu, 2013; Cheng, 2014; Cheng et al., 2016; Cheng & Smyth, 2015a, 2015b; Cheng, Smyth, & Guo, 2015; Davey, Chen, & Lau, 2009; Gao & Smyth, 2011; Knight, Lina, & Gunatilaka, 2009; Sun, Chen, Johannesson, Kind, & Burström, 2016; P. Wang & VanderWeele, 2011; Y. Wang & Otsuki, 2015; Zhang & Zhang, 2017).

2.2. The role of homeownership

Housing satisfaction is one of the most well investigated aspects related to SWB. The literature indicates that the effect of homeownership on SWB can be attributed to the following mechanisms: the portfolio and wealth accumulation of the household (Beracha, Skiba, & Johnson, 2017), individual social engagement, education, and development of the next generation, mental and physical health, psychological perception, and quality of life. However, the findings concerning the relationship between homeownership and SWB are inconclusive (Diaz-Serrano, 2006; Hu, 2013; Ruprah, 2010). Further research is needed to understand these contradictory findings.

The inconsistency of the homeownership-happiness correlation may be ascribed to the following aspects. First, the vague homeownership effect can be partly attributed to an overloaded financial burden, both immediately and in the long run, which may offset the positive effects of owning a self-occupied residence. For instance, Bucchianeri (2011)

provides evidence that a negative association of homeownership with life satisfaction exists among women in Columbus Ohio as a result of work pressure and reduced leisure time for social activities. Zumbro (2014) claims that switching from renter to owner will increase the SWB of those facing low financial pressures. Therefore, the total effect of homeownership on SWB hinges on the relative magnitudes of the positive and negative effects.

Second, the differences between countries are enormous in terms of historical background, cultural traditions, social norms, and economic development. Consequently, individuals from different countries may experience different lifestyles, shared values, spiritual inclinations, and social habits regarding their homeownership decisions. In this sense, the geographical discrepancy between the numbers of research articles can be partly attributed to different backgrounds.

Third, the heterogeneity of homeowners may have resulted in the controversial findings in the literature. The inclusion of demographic heterogeneities at the individual level also weakens the correlation between homeownership and SWB (Rossi & Weber, 1996). However, previous studies based on cross-sectional data fail to consider the household fixed effect; thus, unobserved household characteristics will cause biases (Cheng et al., 2016; Hu, 2013). Ferrer-i-Carbonell and Frijters (2004) argue that the standardization of individual fixed effects exerts an effect on the determining factors of SWB. Therefore, it is necessary to consider individual heterogeneity. Recent studies control for unobserved household heterogeneity by taking into consideration the time-invariant difference between renters and homeowners (Cheng et al., 2016).

Although studies of happiness indicate that homeownership plays a significant role in individual SWB, its causality remains under-researched, especially in the context of China. The inconclusive results can be caused by such endogenous problems as selection bias and omitted variable bias. For instance, homeowners tend to be wealthy and have a stable living situation. Thus, they are more likely to report higher SWB, which may lead to selection bias (Ren, Folmer, & Van der Vlist, 2016; Rohe, Van Zandt, & McCarthy, 2013; Ruprah, 2010). Additionally, the omitted variable problem may also cause bias. Some confounding variables may simultaneously influence homeownership and SWB, such as perceived sense of control, autonomy, security, and social status. Disentangling influential variables from other trivial details is crucial in determining policy implications.

3. Conceptual framework

3.1. Subjective well-being and utility

Self-reported happiness is measured on an ordinal scale, which hinges on the unobservable indirect utility regarding a certain housing status and diversity in individual circumstances. In other words, the self-reported happiness of individual i at time t is propelled by latent outcome S_i^* in the following pattern: $S_i^* = \beta' X_{it} + f_i + v_{it}$, where f_i are time-invariant individual fixed effects. Matrix X_{it} encompasses hedonic characteristics and individual (or household) level features accounting for housing satisfaction. Although the latent outcome cannot be observed, it can be deduced that high self-reported happiness is equivalent to high inner utility according to this linear relationship. In this way, insights into individual behavior can be provided through economic and psychological analyses.

3.2. Advantages of homeownership

The role of homeownership is examined within the framework of cost-benefit analysis. An owner-occupied residence functions as a shelter for a living and an investing asset in the household's portfolio. From the perspective of benefits, homeownership has inhabitable value, investment value, added social value, and intangible psychological value.

The inhabitable values of homeownership satisfy individual fundamental needs and possessive instincts. Homeownership can provide autonomy to customize and upgrade dwellings, the rights of disposal, and perceived control over life (Elsinga & Hoekstra, 2005a). Under these circumstances, an owner-occupied house serves as a commodity and directly increases homeowner utility. There is substantial evidence that owner-occupied housing usually has a better physical and emotional living environment (Galster, 1983). Homeowners benefit from an upgraded living accommodation and neighborhood compared with renters. Thus, for the direct homeownership effect, they are more likely to have higher SWB. However, according to adaption theories, this positive effect is temporary and will gradually diminish as the homeowners become familiar with their current conditions. Although substantial quantitative evidence confirms that hedonic characteristics and housing conditions influence housing satisfaction, the effect is weak and transient. For instance, found a weak positive correlation between living space size and SWB. Hence, it is reasonable to assume that the inhabitable value of homeownership plays a marginal role in bridging the happiness gap between renters and owners.

Homeownership appears to help homeowners accumulate housing and non-housing wealth in a variety of ways. On the one hand, homeowners, who preserve the right to sell their houses in the future, enjoy positive wealth effects since the appreciation of housing prices increases their current wealth (J. Chen, Hardin III, & Hu, 2018). On the other hand, homeownership can also provide greater financial liquidity because of secured borrowing. Meanwhile, homeowners can hedge against risks and avoid the uncertainty of rent levels by having nominally fixed mortgage payments - the housing properties being equivalent to "default" savings with mortgage installments and stable repayments (Goodman & Mayer, 2018). It means that homeownership serves as a guarantee for financial security. Overall, the financial advantages of homeownership can enhance overall SWB. This wealth effect is particularly salient in China due to surging house prices and restrictions in financial investments.

The external social value added to homeownership also motivates a household to become a homeowner. Market-oriented reform in China's housing market has dramatically facilitated rural-to-urban migration (Wu, Stephens, Du, & Wang, 2019). The household registration system (*hukou*) is aimed at restricting inter-regional movement, and has consistently been regarded as a major barrier for potential migrants to move permanently. Under these circumstances, migrants are deprived of the welfare benefits given to local residents. Once they have acquired homeownership, they have greater access to unemployment insurance, health care, pensions, housing benefits, better education opportunities for the next generations, and other exclusive rights. Therefore, homeownership can boost SWB through social welfare packages in China.

Homeownership can also provide intangible psychological benefits, being considered as a symbol of individual social status with housing property treated as a positional good (Foye, Clapham, & Gabrieli, 2018). In addition, Chinese institutional contexts and social norms deepen the role of homeownership in constituting SWB. The perception that homeowners are well educated, better paid, and occupy a high position in the social hierarchy as opposed to renters is widespread, especially in China. Therefore, homeowners may feel superior to renters, and renters may feel dissatisfied surrounded by homeowners. For example, as the sex ratio rises, homeownership contributes to improving individual comparative attractiveness in marriage markets in China. Thus, from the psychological perspective, homeownership provides homeowners with a sense of belonging and self-esteem compared with renters (Diaz-Serrano, 2006; Rohe et al., 2013). Consequently, homeowners are more likely to report higher SWB due to the psychological benefits involved.

3.3. Disadvantages of homeownership

The financial burden of homeownership, restricted mobility and

flexibility in the labor market, housing illiquidity and house price risk, as well as holding and maintenance costs may impair the above-mentioned positive effects of homeownership on SWB. Therefore, the aggregate effect of homeownership on SWB depends on the relative magnitude of the benefits and risks involved.

Goodman and Mayer (2018) find that homeowners can lower housing maintenance costs through "sweat equity". Moreover, homeownership may not necessarily reduce mobility in cosmopolitan districts. Most importantly, the financial burden related to homeownership varies across households of different economic status. For instance, low-, medium-, and high-income residents can respond differently to the achievement of homeownership (Scopelliti et al., 2016). Low-income households are likely to be overwhelmed by an unsettled mortgage, which diminishes their happiness; whereas high-income households will reap the benefits of homeownership without suffering a heavy load of debt, and thus will eventually attain high SWB through homeownership. Nevertheless, homeowners from an economically disadvantaged background can still hold hopeful expectations towards their future lives, with the traditional believe that the possession of land will create peace of mind. Overall, we expect the positive effects of homeownership will overweigh the adverse effects in China.

Hypothesis: a positive association between homeownership and subjective well-being exists.

4. Data

4.1. Data source

The national representative individual-level data are from the CHFS. The 2011 CHFS adopted a stratified three-stage probability proportion (PPS) random sampling method. In the first stage, 80 counties (county-level cities or districts) covering 25 provinces, were randomly chosen from Mainland China's total of 2585 counties (primary sampling units), excluding for Xinjiang, Tibet, and Inner Mongolia. The purpose of the second stage was to sample neighborhood or village committees in each PSU selected in the first stage. Within each neighborhood or village committee, the third stage sampled 2050 households based on residential location. The sampling procedure is strictly subject to the PPS method and the sample sizes in each stage are adjusted according to the regional urbanization rate and economic growth. For every household, the probability of being chosen is not identical under the CHFS sampling design. Hence, the outcomes in the survey are adjusted by sampling weights. The first wave of CHFS in 2011 yielded 8438 households from rural to urban regions. The 2013 CHFS successfully carried out a follow-up investigation into 6846 households from the 8438 households in the CHFS. The survey information encompasses demographic characteristics, subjective attitude, financial and non-financial assets, debts and credit constraints, expense and income, and social and commercial insurance.

The main dataset used in the empirical model is constructed by combining two waves of surveys from 2011 and 2013. The households who are renters in 2011 in the current urban residence are retained. At the same time, the homeowners with an owner-occupied residence as their current living place in 2011 are eliminated, and all households from rural areas are excluded. A balanced dataset is then constructed based on the initially selected households in 2011. Due to the generally high homeownership rate in China, the final dataset contains 992 observations. Thus, we are able to control for time-invariant household characteristics, which allows us to examine changes at the household level before and after the tenure change, and compare households that accessed homeownership with those that did not during the survey period. Instead of using dummy variables to indicate tenure status in cross-sectional datasets, this panel dataset allows us to exploit the cross-household, cross-year variation in housing tenure to evaluate the causal impact of homeownership on SWB.
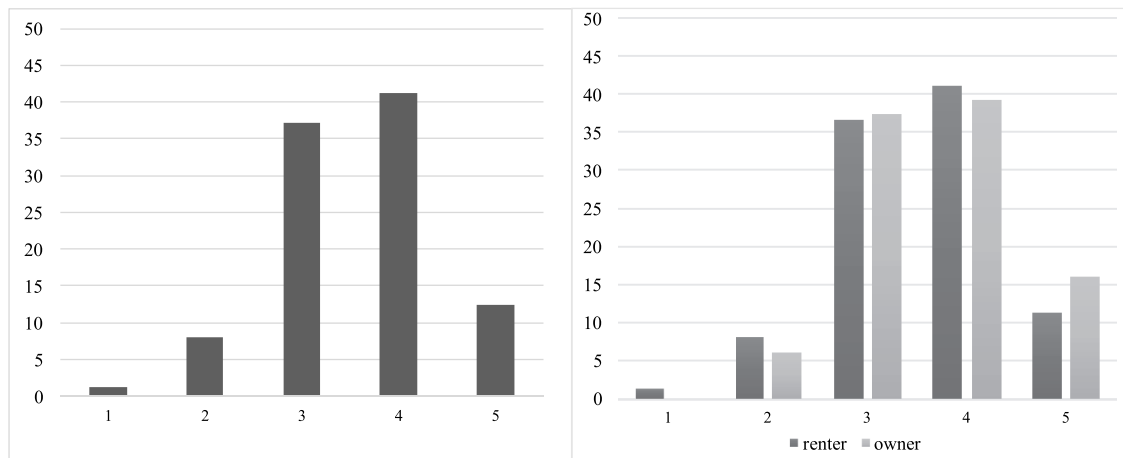
Fig. 1. Distribution of SWB across tenure status.

4.2. Measurement of subjective well-being

In this study, the variable of interest is self-reported SWB. The selected respondents reported their perceived life satisfaction on a five-point scale, ranging from 1 (very dissatisfied) to 5 (very satisfied). This question appears in the household questionnaire rather than of an individual in a certain household. It is worth noting that the respondents in the same household may be different in 2011 and 2013. The majority of respondents are the head of a household or spouse, so the self-reported SWB of respondents are used to represent the overall happiness of the household. 78.5% of respondents are head of the household. Therefore, the respondents' SWB should be able to provide a representative index for the households' SWB. The mean and standard deviation of SWB are 3.55 and 0.86, respectively. Fig. 1 shows the distribution of SWB to be skewed to the right as individuals are inclined to report a relatively high level of SWB, which is consistent with Dolan et al. (2008). Moreover, it is intuitively obvious that homeowners are more likely to evaluate higher SWB in Fig. 1 and Table 3.

Note: The vertical axis indicates the sample proportion for each SWB outcome. The left histogram gives distribution of SWB. The right histogram compares the distribution of SWB across different tenure statuses. For example, 16.28% of homeowners evaluate their SWB as "very good", while only 11.59% of renters report it as "very good".

Table 1 compares the distribution of SWB by housing tenure. This indicates that households with ownership are the most likely to evaluate their quality of life as very good, while older parents without homeownership are more likely to rate their quality of life as bad or very bad.

In addition, following the method proposed by Beck, Levine, and Levkov (2010), we provide three categories of standard deviations of the SWB in the Appendix A: cross-household, within-household, and within household-year. The cross-household standard deviation of SWB is the standard deviation of ($SWB_{it} - \overline{SWB_i}$), where $\overline{SWB_i}$ is the average value of SWB for household i over the sample period. The within-

household standard deviation of SWB is the standard deviation of ($SWB_{it} - \overline{SWB_t}$), where $\overline{SWB_t}$ is the average value of SWB in year t. The standard deviation of SWB within household-year is the standard deviation of ($SWB_{it} - \overline{SWB_i} - \overline{SWB_t}$), where $\overline{SWB_i}$ is the average value of SWB for household i and $\overline{SWB_t}$ is the average value of SWB in year t. These standard deviations enable us to evaluate the economic magnitude of the effect of homeownership on SWB.

4.3. Independent variables

The control variables can be roughly categorized individual characteristics for the respondent in a household, and household indicators. In the first category, we control for demographic and socio-economic variables, including age, gender, health, marital status, and education. The second category of controls comprises the household-level variables, which measure the demographical structure of a family (the proportion of children and the elderly), the burden of caring for family members (e.g. the proportion of ill people) and income of the household head. The definition of key variables including control variables are presented in Table 2.

Previous studies have found the impact of age on SWB to be U-shaped rather than linear, which implies that the marginal effect of age increases with age (Blanchflower & Oswald, 2004; Ferrer-i-Carbonell & Frijters, 2004). In terms of gender, Alesina, Di Tella, and MacCulloch

Table 1
Subjective well-being by homeownership.

Homeownership	Subjective Well-being				
	Very bad	Bad	Fair	Good	Very Good
No	1.59%	8.41%	36.95%	41.46%	11.59%
Yes	0.00%	6.40%	37.79%	39.53%	16.28%
Total	1.31%	8.06%	37.10%	41.13%	12.40%

Note: definition of SWB: response to the question "Overall, how happy are you with your life nowadays?" on a 5-point Likert-scale from 1 (very dissatisfied) to 5 (very satisfied).

Table 2
Definition of key variables.

Variable	Definition
Independent variables	
Tenure	Homeownership (1 = owning; 0 = renting)
Individual characteristics for the respondent:	
Age	Age of respondent
Gender	Gender of respondent (1 = male; 0 = female)
Health	Self-reported health status (1 = very poor, 2 = poor; 3 = fair; 4 = good; 5 = very good)
Marriage	Marital status of respondent (1 = married; 0 = unmarried)
Hukou	Dummy variable indicating whether the households are local residents
Education	1 = illiteracy; 2 = primary school; 3 = middle school; 4 = high school; 5 = technical secondary school; 6 = junior college; 7 = undergraduate; 8 = postgraduate; 9 = doctor
Household characteristics	
Member	Number of household members
Child Ratio	Proportion of children in household
Old Ratio	Proportion of old people in household
Ill Ratio	Proportion of ill people in household
Income	Income of household head

Table 3
Summary statistics.

	Full sample			Homeownership		
	Range	Mean	S.D.	Yes	No	Diff
Dependent variable						
SWB	1–5	3.55	0.86	3.66	3.53	0.13*
Independent variables						
Tenure	No/yes	0.17	0.38	–	–	–
Individual characteristics of the respondent						
Age	19–86	42.74	13.48	44.53	42.36	2.17*
< 45	0/1	0.61	0.49	0.56	0.62	−0.06
45–59	0/1	0.26	0.44	0.3	0.26	0.05
60–74	0/1	0.10	0.30	0.11	0.1	0.01
75–89	0/1	0.03	0.16	0.03	0.03	0
Gender	0/1	0.49	0.50	0.49	0.49	0.01
Health	0/5	2.63	1.42	3.24	2.5	0.73***
Marriage	0/1	0.82	0.39	0.9	0.8	0.09***
Hukou	0/1	0.66	0.47	0.85	0.62	0.23***
Education	1/9	3.87	1.77	4.08	3.83	0.25*
Household characteristics						
Member	1–11	3.11	1.38	3.26	3.08	0.18
Child Ratio	0–0.67	0.18	0.2	0.17	0.18	−0.02
Old Ratio	0–1	0.12	0.28	0.14	0.12	0.02
Ill Ratio	0–1	0.07	0.17	0.07	0.06	0.01
Income	0–12.22	2.59	4.27	5.01	2.08	2.92***

Note: *, **, and *** denote difference in means for the two groups of older parents at the 10, 5, and 1% significance level respectively.

(2004) suggest that women have a high level of SWB, while Clark and Oswald (1994) found the opposite to be the case. However, most research shows that gender difference usually disappears after controlling for other characteristics. Moreover, numerous studies find a significant relationship between health and SWB. Other studies consistently show marriage to be associated with a SWB premium, and therefore a marriage dummy variable is introduced to recognize this effect. Most research has found a positive relationship between income and happiness below a certain threshold, with the correlation evaporating when income exceeds the threshold value (Easterlin, 1974, 1995). Income cannot only influence housing purchase decisions but also the SWB. Hence, we control for householder's income. A wealth of literature provides convincing evidence of the positive relationship between education and SWB (Blanchflower & Oswald, 2004). The summary statistics are presented in Table 3.

5. Empirical model

5.1. Baseline difference-in-differences model

The main objective of this paper is to estimate the causal effect of homeownership on household happiness. Validating whether the correlation is indeed causal is a challenge in the empirical analysis due to the lack of experimental data, hence, we follow the methodology in the program evaluation literature. In our approach, the tenure change from renting to owning is the 'treatment'. The treatment group consists of households that completed the transition from rental to homeownership, and the control group consists of households that continued to be renters during the survey period. Consequently, we employ a difference-in-differences (DD) estimation methodology that exploits the cross-household, cross-year tenure changes to identify the causal impact of homeownership on SWB:

$$SWB_{it} = \beta_0 + \beta \, rto_i \times post_t + \theta rto_i + \eta post_t + \lambda \mathbf{X}_{it} + p_j + \varepsilon_{it}, \qquad (1)$$

where, SWB_{it} denotes the ith household's SWB; rto_i is a treatment group indicator that equals unity if household i completes tenure change from renters to owners between 2011 and 2013 and zero otherwise. $post_t$ is the year fixed effect; the interaction term $rto_i \times post_t$ equals unity in the

years after household i achieve homeownership. By examining how this tenure change is related to the variation in SWB, we can identify the impact of homeownership. The coefficient, β, therefore indicates the impact of homeownership on SWB. A positive and significant β suggests that homeownership exerts a positive effect on the degree of SWB, while a negative and significant β indicates that homeownership pushed SWB lower. In total, we have data for 496 households in the year 2011 and 2013, so the 992 household-year observations serve as the basis for much of our analysis. The control variable $\mathbf{X}_{it}$ is a vector of well-accepted variables accounting for SWB in related literature, which controls for observable individual and household-specific characteristics; p_j refers to province fixed effects, which capture time-invariant unobservable factors at the provincial level; and ε_{it} is the error term.

One concern is that some variables are omitted at the household level, which affects both tenure change and happiness (e.g., family wealth and social network). Therefore, the advantage is taken of the panel data by controlling household fixed effects to account for household heterogeneity.

$$SWB_{it} = \beta_0 + \beta \, rto_i \times post_t + \eta post_t + \lambda \mathbf{X}_{it} + h_i + \varepsilon_{it}, \qquad (2)$$

where, h_i refers to household fixed effects, which can partially absorb unobservable household heterogeneity. The identifying assumption is that the treatment is orthogonal to the error term after controlling household fixed effects h_i, year fixed effects $post_t$, and time-varying controls $\mathbf{X}_{it}$. All standard errors are clustered at the province level, allowing for correlation within provinces.

5.2. Validity of the identification assumptions

Due to the non-random arrangement of homeownership, the OLS estimated results are biased and inconsistent. To address this concern and identify the causal effect, we follow the instrumental variable approach proposed by Lewbel (2012).

Specifically, an internal instrument variable (Lewbel's estimator) is constructed based on the heteroscedasticity of the data rather than relying on external instrument variables (see Lewbel (2012); Cheng et al. (2016)). Lewbel and others (2016) demonstrate that the prerequisites required for the Lewbel's estimator can be satisfied if the endogenous variable is binary. Hence, Lewbel's estimator is used as an instrument for the endogenous binary treatment variable in our baseline difference-in-differences model. Lewbel's estimator is given by:

$$Y_1 = X'\alpha_1 + Y_2\theta_1 + \epsilon_1, \qquad (3)$$

$$Y_2 = X'\alpha_2 + \epsilon_2, \qquad (4)$$

where Y_1 denotes SWB, and Y_2 is the binary treatment variable. The standard instrumental variable is to find that an external variable merely influences whether the household transforms from renter to owner, and has no impact on SWB. Equivalently, the external element only appears in Eq. (4), but not in Eq. (3). Lewbel (2012) constructs a valid instrument variable for Y_2 depending on the heteroscedasticity of ϵ_2, which can be processed in two steps:

(1) Estimate $\widehat{\alpha}_2$ in Eq. (4) and obtain estimated residuals $\epsilon_2 = Y_2 - X'\widehat{\alpha}_2$.
(2) Estimate $\widehat{\alpha}_1$ and $\widehat{\theta}_1$ with two-stage least squares (2SLS) regression with instruments $(Z - \overline{Z})\widehat{\epsilon}_2$. The assumptions required for applying this instrument are that

$$E(X\epsilon_1) = 0, \, E(X\epsilon_2) = 0, \, Cov(Z, \epsilon_1\epsilon_2) = 0, \, Cov(Z, \epsilon_2^2) \neq 0 \qquad (5)$$

where Z represents some or all the elements of X, and $\overline{Z}$ is the sample mean of Z. Lewbel and others (2016) verify the validity of the instrument when the endogenous variable Y_2 is binary.

6. Empirical results

In this section, we take advantage of variation in the tenure changes

of households to test the hypothesis that homeownership is positively associated with SWB. We start by presenting the main results and then discuss robustness and heterogeneity.

6.1. Main results

Table 4 presents the main estimated results of the DD model in Eqs. (1) and (2). It should be noted that the control variables generally carry the expected signs, but are not significantly different from zero, except for *income* and *marriage*. This may be due to the household and year effects explaining much more of the total variation in SWB than these variables. The estimate of the householder's income exerts a significant positive impact on SWB, which is consistent with previous findings (Cheng et al., 2016).

In column 1, the relationship between homeownership and SWB is examined, controlling for province fixed effects and year fixed effects. Column 2 includes individual and household-level controls. Consistent with the previous conceptual framework, homeownership has a positive impact on SWB. In columns 3 and 4, we control for household (instead of the province) fixed effects to capture time-invariant attributes across household (e.g., wealth and social network). The estimates of the DD term remain statistically significant with meaningful magnitudes. The column 4 results show that homeownership induced a 0.3560 increase in SWB, which is sizable in an economic sense. To estimate the economic influence of this finding, we compare the coefficient estimate to the standard deviation of SWB after controlling for household and year fixed effects. This standard deviation is 0.4590 as shown in the Appendix A, suggesting that homeownership explains about 77.56% of the variation of SWB after controlling for the fluctuations in SWB accounted for by household and year effects. Moreover, our estimated effect is approximately 48% higher than Cheng et al.'s (2016) finding using a single wave of CHFS data (year 2011), which may not have been able to mitigate the omitted-variable bias.

Previous studies verify that new owners may have to bear financial burdens, which are expected to decrease happiness. Therefore, our estimated effects of homeownership on happiness are downward biased. Nevertheless, homeownership has a sizeable effect on happiness. Further details of the financial constraint are provided in Section 6.3.

6.2. Robustness checks

6.2.1. Reverse causality

The identification of the empirical result rests on the assumption that the household tenure change (renter to owner) was unaffected by SWB. In Table 3, tenure change is regressed with the SWB of the household in the year 2011. The results show that not all the coefficients of SWB are significantly different from zero, indicating that the timing of the tenure change does not vary with the degree of pre-existing SWB (Table 5).

6.2.2. Omitted variable bias

To verify the extent to which the estimates are affected by omitted variables, a placebo test is conducted by randomly assigning the tenure change to households (La Ferrara, Chong, & Duryea, 2012). Specifically, 172 of all the households[2] are randomly selected and assigned the status of tenure change from renter to owner between 2011 and 2013. The placebo test of DD is estimated using the specification of the last column in Table 4. Ideally, the false DD variable should have no significant estimate, with a magnitude close to zero due to the random data generation process. The placebo test is repeated 500 times and the distribution of DD estimates (i.e., $rto_i \times post_t$) is plotted in Fig. 2. The distribution of the DD estimates is centered on around zero with a

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[2] The actual number of households who experienced tenure change between 2011 and 2013 was 172.

Table 4
Homeownership and subjective well-being (OLS results).

	Dependent variable: Subjective well-being			
	(1)	(2)	(3)	(4)
Homeownership	0.3358***	0.3326***	0.3551***	0.3560***
	(0.10)	(0.10)	(0.09)	(0.09)
Treatment group	−0.0882	−0.1688*		
	(0.09)	(0.09)		
Age		−0.0269		−0.0141
		(0.03)		(0.05)
Age^2		3.0971		2.1555
		(2.54)		(5.94)
Gender		−0.0248		−0.1349
		(0.07)		(0.15)
Marriage		0.1543		0.4977***
		(0.26)		(0.09)
Health		−0.1120*		−0.0117
		(0.06)		(0.05)
Hukou		0.1536		−0.0274
		(0.16)		(0.22)
Education		−0.0571**		0.0323
		(0.02)		(0.06)
Income		0.0195*		0.0227**
		(0.01)		(0.01)
Child ratio		0.1924		−0.2107
		(0.20)		(0.32)
Old ratio		0.3073		−0.0931
		(0.27)		(0.31)
Ill ratio		−0.4998		−0.2831
		(0.30)		(0.46)
Province fixed-effects	No	Yes	No	Yes
Household fixed-effects	Yes	No	Yes	No
Year fixed-effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.06	0.14	0.87	0.87
Observations	992	992	992	992

Note: This table reports the OLS coefficients in the baseline DD model in Eqs. (1) and (2). The interaction term $rto_i \times post_t$ in the DD specification in Eqs. (1) and (2) are estimated to identify the impact of homeownership. The standard errors (in parentheses) are corrected for clustering at the province level.
The results are adjusted by sampling weights. ***, **, and * denote significant at the 1, 5, and 10% level respectively.

Table 5
Timing of tenure change and pre-existing subjective well-being.

	Dependent variable: Treatment group		
	(1)	(2)	(3)
Subjective well-being (in 2011)	0.0043	0.0093	−0.0080
	(0.03)	(0.02)	(0.02)
Controls[a]			Yes
Province fixed effect		Yes	Yes
Observations	496	496	496
Adjusted R^2	−0.0020	0.1163	0.2022

Note: Standard errors (in parentheses) are corrected for clustering at the province level. The results are adjusted by sampling weights. The treatment group consists of households that completed tenure change from rental to homeownership. The cross-sectional dataset in the year 2011 is used.
***, **, and * denote significant at the 1, 5, and 10% level respectively.
[a] Controls not listed include those in column 4 of Table 4.

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standard deviation of 0.1481. The benchmark estimate (i.e., the vertical red line) is located at the tail of the distribution of the false estimates; these results suggest that the positive causal effect of homeownership on happiness is less likely to be driven by omitted variables.

6.2.3. Selection on observable

One potential drawback of a difference-in-difference strategy lies on the validity of choosing renters without tenure change as the control group. The disparity in SWB between treated and untreated households
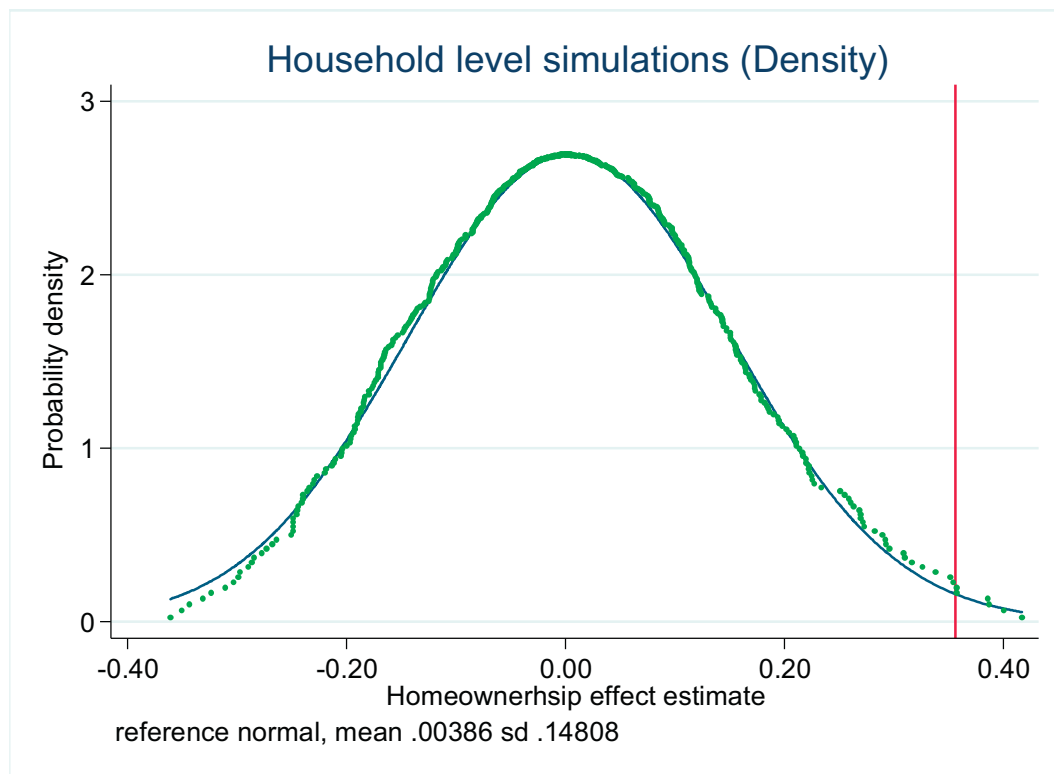
Fig. 2. Distribution of DD estimates based on the placebo test.

may be ascribed to pre-existing differences. In order to address the endogenous concern and selection bias, we employ propensity score matching (PSM). Given the highly imbalanced residential prices across provinces in China, the difference between matched-treated and control households may originate from regional divergences. Therefore, PSM within a cluster of provinces is employed to ensure the exact match at the provincial level. We match each household undergoing a tenure change from renting to owning with a comparable household for which such a move did not happen during the survey period. The matching strategy allows us to extract the pure effect of homeownership from the other effects of confounding factors.

PSM with kernel matching is employed to mitigate selection bias. The variables used include the total household assets, income of the head householder, as well as such individual respondent characteristics as gender, age, marriage, *hukou* type, and health status. Thus, the se-lection-on-observable concern can be addressed, and the initial differ-ences removed to satisfy the common trend premise. Columns (1) to (4) of Table 6 show the estimated regressions with the same specifications of the benchmark models in Table 4 using kernel matching. Since the PSM estimators are adjusted by sampling weights, the unweighted OLS results are provided as a comparison, indicating that the magnitudes of β in PSM-DID model are slightly higher than the coefficients of the unweighted OLS estimations. These results also provide supportive evidence of the causal relationship between homeownership and SWB.

6.2.4. Instrument variable method

Lastly, the Lewbel (2012) method is employed as an alternative way to address potential endogeneity. The constructed instrument variable is subjected to under-identification, weak identification, and over-identification tests. The validity of this instrument variable is demon-strated by these tests according to rule of thumb. The 2SLS results are provided in Table 7 and are approximately equivalent to the baseline OLS model in Table 4, which implies that endogeneity is not a major concern, and thus the OLS regressions can be relied on for the rest of the regressions.

Table 6
Matching estimates of homeownership and subjective well-being.

	Dependent variable: subjective well-being			
PSM-DID	(1)	(2)	(3)	(4)
Homeownership	0.2468***	0.2375***	0.2468**	0.2569**
	(0.07)	(0.07)	(0.10)	(0.09)
Unweighted OLS				
Homeownership	0.2176***	0.2194***	0.2176***	0.2287***
	(0.06)	(0.06)	(0.06)	(0.06)
Controls[a]		Yes		Yes
Province fixed effect	Yes	Yes		
Household fixed effect			Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	972	972	972	972
Adjusted R²	0.0093	0.0470	0.4327	0.4474

Notes: Table reports the OLS results in the DD model with the matching methods in Eq. (2). The logit model is employed to *calculate* the propensity scores. The standard errors (in parentheses) are corrected for clustering at the province level. The results are NOT adjusted by sampling weights.
***, **, and * denote significant at the 1, 5, and 10% level respectively.
[a] Controls not listed include those in column 4 of Table 4.

6.3. Heterogeneous treatment effects

The heterogeneous treatment effects of homeownership across different groups are further scrutinized. We examine whether the impact of homeownership varies across socioeconomic and demographic groups. Subgroup regressions are estimated to illustrate the heterogeneous homeownership effect. If the impact of homeownership on SWB varies in a theoretically predictable manner, the heterogeneity effect is informative in inferring the mechanism underlying the causal effect.

First, we examine the heterogeneous effects of homeownership on low-income households versus relatively high-income households. A proxy is introduced for housing affordability, *high income_i*, a dummy variable equal to one if household income is above the population

Table 7
Instrumental variable regressions.

	Dependent variable: subjective well-being			
	(1)	(2)	(3)	(4)
Homeownership	0.3176***	0.3372***	0.3154***	0.3279***
	(0.10)	(0.10)	(0.11)	(0.10)
Controls[a]		Yes		Yes
Province fixed effect	Yes	Yes		
Household fixed effect			Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	992	992	992	992

Notes: The table reports the IV results in the DD model. The standard errors (in parentheses) are corrected for clustering at the province level. The results are adjusted by sampling weights.

***, **, and * denote significant at the 1, 5, and 10% level respectively.

[a] Controls not listed include those in column 4 of Table 4.

median level in 2011. In Table 8 (column 2), an interaction term is introduced between $rto_i \times post_t$ and $high\ income_i$, and the same specification adopted as in column 2 of Table 4. The result shows that the estimate of the interaction term is negative but not significant. In column 4, an alternative proxy is adopted of the household situation, $liquidity\ constraint_i$, a dummy variable equal to one if the liquid financial assets (i.e., the sum of cash and deposit) of a household is below the median of the full sample in 2011. The coefficient of the interaction term is also not significantly different from zero. The positive sign of the estimate may arise from the possibility that liquidity constrained households may improve their financial status by collateralizing their property. These results show there is no evidence to support the notion that the treatment effects of homeownership would be eroded by financial constraints.

Table 9 explores the heterogeneity in homeownership effects by stratifying sampled respondents across initial demographic characteristics. We divide the sample based on whether the median values of demographic characteristics (e.g. family size, education attainment of respondents in the year 2011) in the first survey year are above or below the population median level. The results in column 1 and 2 indicate that the impact of homeownership on SWB was statistically significant only for local permanent residents. The primary explanation is that natives and migrants are faced with different financing barriers when acquiring homeownership (Chen & Yang, 2017). With the Chinese *hukou* system, migrants without local *hukou* are generally eliminated from the housing benefits reserved for local residents. Meanwhile, the restrictions on the local housing market, coupled with the *hukou* system, pose an obstacle for them in housing consumption. A

family size above the population median level occurs when at least one child co-resides with its parents. The results suggest that homeownership has a more salient impact on extended families compared with nuclear families. Wu et al. (2019) also find that homeownership and family composition exert significant interaction effects on SWB. Moreover, respondents whose age is below 45-years-old in the year 2011 enjoy higher levels of SWB. It means the homeownership effect is more pronounced for younger families. Moreover, the positive homeownership effect is statistically significant for those whose educational attainment is higher than the population median level. Moreover, married households gain a substantial increase in SWB after accessing homeownership. To conclude, therefore, these results clarify the importance of considering the heterogeneous treatment effects of homeownership across socioeconomic and demographic groups. The heterogeneity is one of the reasons why previous studies produced inconclusive results concerning the homeownership-happiness paradox.

7. Conclusion

This paper investigates the causal relationship between homeownership and SWB based on household-level panel data collected from CHFS in 2011 and 2013. The household-level panel data allows us to control for household heterogeneity, as well as deal with omitted variable bias by including household fixed effects. After controlling for household and year fixed effects, the empirical results show that homeownership translates into a 0.356 unit (10% of its sample mean) increase in SWB, explaining about 77.56% of the variation of SWB. We address reverse causality, omitted variables bias, and non-random selection of observables through identifying strategies. The robustness tests suggest that endogeneity may not be a major concern. Moreover, the impact of homeownership on income SWB varies across households with distinct economic, financial, and demographic characteristics in the first survey year. Native residents, extended households, younger households, married households, and those with higher education attainment levels are more likely to experience a positive homeownership effect. There is no evidence that the treatment effect of tenure change is affected by the financial constraints faced by new homeowners.

The local governments are motivated to increase the rate of owner-occupied housing for welfare improvement due to the private and social benefits of homeownership. Specifically, homeownership can not only boost economic growth but also increase 'asset-based security', build self-reliance, and reduce the demand for public welfare (Doling & Ronald, 2014). Thus, an increased understanding of the relationship between homeownership and SWB will be beneficial for policymakers to develop sustainable housing policies. In conclusion, given the

Table 8
Homeownership and financial constraints.

	Dependent variable: subjective well-being			
	(1)	(2)	(3)	(4)
Homeownership	0.3833**	0.3456**	0.2683*	0.2872*
	(0.15)	(0.14)	(0.15)	(0.15)
Homeownership × high income	−0.0949	−0.0258		
	(0.17)	(0.15)		
Homeownership × liquidity constraint			0.1413	0.0957
			(0.17)	(0.16)
Controls[a]		Yes		Yes
Province fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	992	992	992	992
Adjusted R^2	0.0637	0.1371	0.0647	0.1378

Notes: The table reports the estimation of heterogeneous effects along the dimensions of household income and liquidity constraint. The standard errors (in parentheses) are corrected for clustering at the province level.

***, **, and * denote significant at the 1, 5, and 10% level respectively.

[a] Controls not listed include those in column 4 of Table 4.

Table 9
Heterogeneous treatment effects of homeownership.

	Dependent variable: subjective well-being									
	Hukou: Local		Family Size		Age		Education		Marriage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Yes	No	Big	Small	< 45	≥ 45	High	Low	Yes	No
Homeownership	0.2298**	0.1183	0.5290***	0.0920	0.3151**	0.2693	0.3624*	0.1157	0.1793***	0.3543
	(0.11)	(0.12)	(0.06)	(0.15)	(0.15)	(0.17)	(0.20)	(0.12)	(0.06)	(0.24)
Controls[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	602	278	496	496	652	340	496	496	776	216
Adjusted R^2	0.8721	0.8802	0.8719	0.8829	0.8724	0.8957	0.8900	0.8739	0.4481	0.3947

Notes: The table reports the estimation of heterogeneous effects along the dimensions of hukou type, family size, age, education, and marital status of respondents in the first survey year. The standard errors (in parentheses) are corrected for clustering at the province level.

***, **, and * denote significant at the 1, 5, and 10% level respectively.

[a] Controls not listed include those in column 4 of Table 4.

importance of homeownership for SWB and the prevalence of social inequalities in accessing homeownership, it is clear that housing un-affordability should be addressed through public policies. For instance, the authorities should establish a well-functioning financing system to promote homeownership and reduce the constraints on borrowing by low- and middle-income households (Shi, Chen, & Wang, 2016). Many young renters and migrants attempting to access homeownership are restrained due to insufficient income for a down payment or inelig-ibility for a mortgage loan. In particular, the affordable housing policy should aim to eliminate the obstacles preventing homeownership by those who would primarily benefit.

Declaration of Competing Interest

None.

Appendix A

Table A1
Standard deviations of subjective well-being.

	Equation	S.D.
Cross-household	$(SWB_{it} - \overline{SWB_i})$	0. 4592
Within-household	$(SWB_{it} - \overline{SWB_t})$	0.8577
Within household-year	$(SWB_{it} - \overline{SWB_i} - \overline{SWB_t})$	0.4590

Table A2
Timing of tenure change and pre-existing subjective well-being.

	Dependent variable: Treatment group		
	(1)	(2)	(3)
Subjective well-being (in 2011)	0.0043	0.0093	−0.0080
	(0.03)	(0.02)	(0.02)
Age			0.0028
			(0.01)
Age^2			−0.0000
			(0.00)
Gender			−0.0101
			(0.04)
Marriage			0.0538
			(0.07)
Health			−0.0189
			(0.02)
Hukou			0.1645***
			(0.03)
Education			0.0370***

Table A2 (*continued*)

	Dependent variable: Treatment group		
	(1)	(2)	(3)
			(0.01)
Income			0.0772***
			(0.02)
Child ratio			0.4161***
			(0.14)
Old ratio			−0.0614
			(0.12)
Ill ratio			−0.4497**
			(0.16)
Constant	0.2624**	0.2446***	−0.1308
	(0.11)	(0.07)	(0.26)
Province fixed effect		Yes	Yes
Observations	496	496	496
Adjusted R^2	−0.0020	0.1163	0.2022

Notes: Standard errors (in parentheses) are corrected for clustering at the province level. The results are adjusted by sampling weights. The treatment group consists of households that completed tenure change from rental to homeownership. The cross-sectional dataset in the year 2011 is used.
***, **, and * denote significant at the 1, 5, and 10% level respectively.

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