

Homeownership and household formation: no house, no marriage?

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Abstract

This paper examines the effect of homeownership on the likelihood of marriage. Due to many benefits brought by homeownership, which have been highlighted in existing research, owning one's own house may increase a person's attractiveness in marriage market, and homeowners are therefore more likely to get married than otherwise identical renters. We test this hypothesis by comparing the marriage rate between homeowners and renters in China where the house is often regarded as a prerequisite for marriage. Using data from the China Family Panel Studies (CFPS) survey, we find that, after controlling for observables, homeownership increases the likelihood of marriage by almost one percentage point. We also find that the positive effect of homeownership is more prominent for women, people aged above 40, as well as those with low education. Furthermore, homeowners are much more likely to enter into marriage than their renting counterparts in regions with highly skewed sex ratio. Our results are robust after controlling for the accompaniment of homeownership to marriage, reverse causality of marriage to homeownership, model misspecification, and personality characteristics.

Key words: Homeownership; Marriage; Disparity; China

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[Abstract] *This paper examines the effect of homeownership on the likelihood of marriage. Due to many benefits brought by homeownership, which have been highlighted in existing research, owning one's own house may increase a person's attractiveness in marriage market, and homeowners are therefore more likely to get married than otherwise identical renters. We test this hypothesis by comparing the marriage rate between homeowners and renters in China where the house is often regarded as a prerequisite for marriage. Using data from the China Family Panel Studies (CFPS) survey, we find that, after controlling for observables, homeownership increases the likelihood of marriage by almost one percentage point. We also find that the positive effect of homeownership is more prominent for women, people aged above 40, as well as those with low education. Furthermore, homeowners are much more likely to enter into marriage than their renting counterparts in regions with highly skewed sex ratio. Our results are robust after controlling for the accompaniment of homeownership to marriage, reverse causality of marriage to homeownership, model misspecification, and personality characteristics.*

1. Introduction

It is hard to deny the importance of homeownership. The existing literature has provided evidence of numerous economic and social consequences on the transition from renting to homeownership, including household behavior, household investment strategy and wealth accumulation, household mobility, labor force behavior, urban formation and demographic segregation, housing maintenance, political and social activities, health and mental status, entrepreneurial engagement, and child outcomes (Chen and Hu 2018; Chetty et al. 2017; Cocco 2005; Coulson and Fisher 2009; Flavin and Yamashita 2002; Haurin et al. 2002; Krumm and Kelly 1989). Besides, homeownership status can theoretically increase a person's attractiveness in the marriage market since homeownership is an important status and many benefits are related with homeownership (Clarke and Zavisca 2015; Grinstein-Weiss et al. 2014; Zheng et al. 2016). However, the existing research about the relationship between

homeownership and marriage is relatively less. Further, the mechanism revealing how homeownership status may affect the marriage likelihood is not well established.

This paper is an empirical investigation into the relationship between homeownership and household formation. There are two previous studies addressing similar topic of our research. Eriksen (2010) finds homeownership subsidies increase the marriage rate of low-income households using data from the Individual Development Account (IDA) program that provides treated participants down payment assistance when purchasing a house. However, applying propensity score analysis to isolate the characteristics closely related with homeownership as well as marriage, Grinstein-Weiss et al. (2014) find that the marriage probability of unmarried lower-income homeowners is lower than their renting counterparts. The contradictory result may be caused by the differences in data and methodology used. Recognizing that our research is not the first to investigate relations between homeownership and marriage, the literature is extended in several specific ways.

First, the present paper investigates the homeownership and marriage relationship using longitudinal data from a nationally representative survey in China. With the tradition of appreciating homeownership and the growing increased pressure in the marriage market arising from increasingly skewed sex ratio in China, those who are unmarried may attempt to enhance their comparative attractiveness for marriage by buying a house (Wei and Zhang 2011). This offers us a rare opportunity to examine whether homeownership plays an important role in the likelihood of marriage. Based on individual-level micro data from China Family Panel Studies (CFPS) covering the years of 2010, 2012 and 2014, this paper finds that homeownership is positively related with the probability of marriage. This finding remains consistent after controlling for the accompaniment of homeownership to marriage, reverse causality

of marriage to homeownership, model misspecification, and personality characteristics.

Second, we investigate whether the homeownership effect on marriage is more prominent for certain groups. Closer examination of the cross effects of homeownership and gender, age, education attainment and regional sex ratio, respectively, reveals that the positive effect of homeownership is more pronounced among female, elderly and low-educated people, as well as in regions with high sex ratio imbalance. Our research is the first, or one of the first, to compare the relations between homeownership and marriage among groups with different characteristics, although Eriksen (2010) and Grinstein-Weiss et al. (2014) tangentially examine the homeownership effect focusing on low-income households.

The rest of the paper is organized as follows. Section two briefly reviews the related studies. Section three then discusses the CFPS data and traces out the basic econometric strategy, which leads to formal analyses in section four and the presentation of primary empirical findings. Section five examines potential explanations. In the sixth section, we present further empirical findings that indicate a stronger homeownership effect among certain groups. The last section concludes the article with some remarks.

2. Literature Review

In this section we review some of the major studies in the literature about the determinants of marriage and the relationship between homeownership and marriage.

2.1. Determinants of marriage

Within the substantial literature investigating household formation, there is consensus that certain factors consistently have impact on it. Overall, determinants of

marriage can be grouped into two categories: i) internal individual and household characteristics, and ii) external environmental factors.

Individual and household characteristics are one of the most well investigated factors related to household consumption. For instance, educational level puts off marriage since higher educated people, especially women, experience a greater opportunity cost of having children, and have higher expected earnings and thus be less reliant on financial support provided by a prospective spouse (Gutiérrez-Domènech 2007; Moffitt 1990). Household income increases a person's marriage prospects since some degree of financial stability is a prerequisite for marriage (Grinstein-Weiss et al. 2014); the importance of household income is more pronounced in China since it is common for Chinese parents having a son to raise their savings to enhance their son's attractiveness to a potential wife (Wei and Zhang 2011). Gender and age are two other demographic variables commonly controlled in the model (Grinstein-Weiss et al. 2014; Gutiérrez-Domènech 2007). Women value marriage more than men because they pay more attention to factors related to the marriage, such as commitment or the expectation of having children (Mukhopadhyay 2008).

Another strand of literature highlights the importance of external environment, such as policies related with marriage, labor market conditions, marriage market conditions, and technologies reducing the search cost in the marriage market. More-generous welfare programs, such as the Aid to Families with Dependent Children (AFDC), that provide benefits almost exclusively to needy single parents with children have been blamed for lower rates of marriage because of the eligibility restrictions (Hoyne 1997; Grogger and Bronars 2001). Another policy called the Earned Income Tax Credit (EITC) is also found to be partially responsible for the

decreases in marriage rates. For instance, Herbst (2011) finds that rises in the EITC are related to declines in marriage rate by constructing a transition-based measure of marriage rate over the period 1977 to 2004, while Eissa and Hoynes (2004) report a heterogeneous result that the EITC increases the marriage rate among low-income households, but has a negative effect on moderate-income households. Labor market conditions also have an impact on individual's decision of marriage. Gutiérrez-Domènech (2007) shows that precarious labor markets negatively influence family formation, especially by postponing marriage. Using the 1991 Spanish Socio-demographic Survey, Ahn and Mira (2001) also find a negative effect of periods of non-employment and temporary employment on the likelihood of marriage. Sex ratio, i.e., the relative numbers of men and women, is the most frequently examined marriage market factor in existing research. For example, Angrist (2002) documents a positive effect of unbalanced sex ratios on the probability of female marriage since high sex ratios increase bargaining power of the females in the marriage market. Technologies that help to increase the matching efficiency in the marriage market also matters for marriage probability. Bellou (2015) empirically investigates the influence of Internet diffusion in the USA since the 1990s on marriage rates, and results suggest that the spread of Internet has significantly contributed to increased marriage rates since it has the potential to reduce search frictions by raising available options or by reducing search costs.

2.2. The Relationship between Homeownership and Marriage

Until recently, there have been relatively few studies on the relationship between homeownership and marriage. In theory, homeowners are more likely to get married than renters since homeownership status increases their competitiveness in the

marriage market. The homeownership effect that works on individual's marriage probability through three mechanisms: i) housing wealth accumulation, ii) other financial wealth related to homeownership, iii) social resources correlated with homeownership, iv) embodiment of social status, and v) other benefits accruing to homeowners.

First, homeowners can accumulate greater wealth than renters. The amount of housing wealth accumulation is especially large in China where housing market started to heat up since 2004 when the open auction and listing policy was implemented in the transfer of state-owned land use rights for all types of urban land (Deng et al. 2012). Second, homeowners have more financial resources associated with homeownership. Owner-occupied housing is the single biggest asset in most households' balance sheets owing to its high value (Chen et al. 2018). Individuals who can afford a house may imply they have stable incomes, some extent of financial literacy and other financial assets (Grinstein-Weiss et al. 2014). Third, homeowners have more valuable and advantageous social resources than renters. The relatively high transaction costs in connection with search and transportation make homeowners less mobile than renters (Lundborg and Skedinger 1999). As compared with renters, homeowners have greater participation in community activities and local political activities, and thus have more social networks (Dietz and Haurin 2003; Glaeser and Sacerdote 2000). Fourth, homeownership is considered as a crucial embodiment of social status. House provides a sense of ontological and emotional security for people living together under one roof. It is also the staging ground for many types of consumption and various activities. These practical functions transform a dwelling into a cultural embodiment, which symbolizes social status (Clarke and Zavisca 2015). The importance of homeownership is more pronounced in China since the

Chinese have a strong cultural tradition of valuing homeownership (Chen and Hu 2018; Yang et al. 2018). Buying a house in China has become both an important investment channel and a prerequisite for marriage (Li and Wu 2014). Fifth, many public resources, especially public education, are limited to homeowners. Neighborhood school policy that students have to attend the schools nearest to the communities in which they live has been implemented in many China's cities (Feng and Lu 2013; Zheng et al. 2016). However, only the children of homeowners rather than renters are eligible for local public education, even when they both reside in the same public school's attendance zone (Zheng et al. 2016).

Purchasing a house, in contrast to renting one, is a large investment for most individuals that simply not everyone can afford. Housing as a status good (also known as positional good) is especially important in the marriage market. Owning a house may be a crucial determinant for a single man of how appealing he is as compared to his competitors in the eyes of the single women (and vice versa) (Wei et al. 2012).

3. Data, Variables and Model Specification

3.1. China Family Panel Survey

This study uses data from the China Family Panel Survey (CFPS henceforth) in 2010, 2012 and 2014. CFPS is a nationally representative survey of Chinese communities, families, and individuals. This program is funded by the Chinese government cooperating with Peking University, carried out by the Institute of Social Science Survey (ISSS) of Peking University, and supported by several of China's official organizations, including the National Population and Family Planning Commission, the State Statistics Bureau, Shanghai University, Sun Yat-Sen University and Lanzhou University, as well as the Survey Research Center at the University of Michigan. This longitudinal survey has covered a nearly nationally

representative sample. The baseline survey in 2010 interviewed almost 15,000 households and 30,000 individuals in 25 mainland provinces (excluding remote provinces with high concentrations of ethnic minorities, namely Inner Mongolia, Xinjiang, Tibet, Hainan, Ningxia, and Qinghai), with an approximately response rate of 79%. The respondents are tracked through follow-up surveys. More detailed information about the survey can be found in its official website (<http://opendata.pku.edu.cn/dataverse/CFPS>). Empirical findings based on this survey's systematic and scientific data are often used for government policy decisions.

The CFPS dataset has several strengths for the current research. First, the survey contains information on housing tenure and marriage status of respondents surveyed through a multi-stage random sampling design with implicit stratification. This allows us to examine the homeownership effect on the formation of new families. The survey also contains an explicit question on whether the respondent or his/her parents are the registered owners of the house. The answer to this question offers us an more accurate estimation of homeownership effect by an explicit comparison of marriage rate between registered homeowners and renters, since homeownership is usually concomitant with marriage. For example, a renter will become a homeowner after getting married with someone who owns a house. The data also collects information about the time of house purchase and marriage, based on which we can mitigate the potential issue of reverse causality in the relationship between the homeownership and marriage by excluding individuals who report themselves as homeowners while their houses are obtained after marriage.

Second, each respondent in this longitudinal survey is assigned a unique identification code. Using this code we can construct a panel dataset and apply panel

data models to attenuate potential endogeneity bias associated with omitted variables in the estimation. Third, the CFPS survey provides comprehensive and high-quality data. The interview schedules are assisted by the Computer Assisted Personal Interviewing (CAPI) technology provided by the Survey Research Center (SRC) in the University of Michigan. Interview schedules for each member of the household are therefore tailor designed. Through a multi-stage random sampling design with implicit stratification, the survey gathers each individual's demographic characteristics and socioeconomic status, as well as each household's income.

3.2. Variables

Of primary interest is the question in the survey about individual's marital status. The dependent variable (*Married*) in this paper is an indicator variable of marriage, which equals to one if the marital status reported in the survey is married, or equals to zero otherwise. Equally important, the CFPS records detailed categories of housing tenure of each household surveyed, which can be used to define the independent variable (*Homeowner*) that is an indicator variable of people who own a house. We control for a number of factors at individual and household level that may affect family formation. Specifically, following previous research, we control for individual's highest education attainment, age, gender, hukou status (household registration status), nationality, and political status, and household income (measured as # yuan) (Grinstein-Weiss et al. 2014; Gutiérrez-Domènech 2007; Moffitt 1990; Yang et al. 2018). Table 1 provides listings of definitions of variables in the sample.

** Table 1 is inserted into here **

Our initial data sample contains about 174,180 observations in the year of 2010, 2012 and 2014. We apply three screenings to the sample. First, we restrict our sample to individuals aged between 22 and 60 years old considering that the legal marriage age is 22 or older for male and 20 or older for female in China and the issue investigated in the paper is marriage choice. Second, we eliminate observations with missing value; third, we limit the sample to individuals who repeatedly appear in these three years. The final three-year panel dataset contains a total of 62,385 observations (include 10,485 households and 20,795 individuals covering 167 counties (or equivalentents) in 25 provinces).

The descriptive statistics of variables used in the analysis, as displayed in Table 2, suggests clear differences between homeowners and renters in almost every aspect. The average marriage rate is 89.1% in China, much higher than that in developed economies and the other emerging economies. The average marriage rate for homeowners is 89.6% vs 85.7% for renters, suggesting homeowners are more likely to get married. In terms of personal characteristics, homeowners tend to have higher educational attainment than renters, and their mean household income is also higher. Several the other dimensions, including age, hukou status, political status and household income, are quite different between these two groups. These significant differences warrant further examination in which these variables are being properly controlled.

** Table 2 is inserted into here **

Using the CFPS data, we first plot a scattered graph between homeownership rate and marriage rate at the county level to sketch a general relationship of them. From

Figure 1, a country's homeownership rate is positively related with the marriage rate. This finding suggests that there is a clear relationship between the two variables at an aggregate level, but further examination after controlling for household heterogeneity is needed.

* Figure 1 is inserted into here *

3.3. Model Specification

We use the standard probit model to examine the relations between homeownership and marriage. The structure of the probit model has the latent variable format:

$$Y_{ijt}^* = G(\beta_0 + \beta_1 Homeowner_{ijt} + \alpha X + \theta_t + \varphi_j + \varepsilon_{ijt}) \quad (1)$$

$$Married_{ijt} = \begin{cases} 1 & \text{if } Y_{ijt}^* > 0 \\ 0 & \text{if } Y_{ijt}^* \leq 0 \end{cases} \quad (2)$$

The equation (1) is the latent variable equation, where Y_{ijt}^* is a latent variable that is a function of homeownership ($Homeowner_{ijt}$), control variables (X), year dummies (θ_t), county dummies (φ_j) and an error term (ε_{ijt}). $G(\cdot)$ is a function with a value between 0 and 1, which is set as the normal cumulative distribution function in our analysis. $Homeowner_{ijt}$ is an indicator variable, which equals to one for people who own a home or zero otherwise. X is a vector of control variables at the individual or household level as defined in Table 1. β_1 is the coefficient of interest in equation (1), which captures the homeownership effect on marriage. We expect this coefficient

to be positive due to generally owning a house increases individual's competitiveness in the marriage market.

4. Primary Empirical Findings

We estimate a series of different specifications by gradually increasing the number of controlled variables to examine their effects on household formation. The estimated coefficients, standard errors, marginal effects and significance levels are reported in Table 3. We begin with the simplest specification by controlling for homeownership only. The results, as reported in column (1) of Table 3, show that the coefficient of $Homeowner_{ijt}$ is positive and statistically significant at the 1% level, without controlling for the other observables. The marginal effect indicates that homeowners are 2.8 percentage points more likely to get married than renters, holding everything else equal. In Specification 2 we control for individual and household variables (include education, age, gender, hukou, nationality, political status, and household income). The results are reported in Column (2) of Table 3. The difference in marriage rate between homeowners and renters decreases to 2.1 percentage points, but remains significant at the 1% level. The pseudo R-squared tremendously increases from 0.1% to 10.1%, implying that individual and household characteristics explain away a majority of the variation in marriage probability.

In Specification 3, we further immunize our estimations from potential impacts of aggregate (time-series) trends and time-invariant regional unobservables by controlling for year and county fixed effects. The results are reported in column (3) of Table 3. After controlling for the time trends and regional unobservables, the difference between homeowner and renter in marriage rate narrows further, from 2.1 to 1.0 percentage point. The pseudo R-squared increases from 10.1% to 13.2%,

implying that it is important to control for county and year dummies in predicting individual's likelihood of probability.

** Table 3 is inserted into here **

5. Potential Explanations

There are probably a number of explanations to the basic pattern of results that homeowners tend to have higher marriage rates than renters that we observe in the data. In this section, we attempt to certify the homeownership effect by excluding the following four possible reasons: (i) the accompaniment of homeownership to marriage, (ii) reverse causality of marriage to homeownership, (iii) model misspecification, and (iv) unobservable personality characteristics.

5.1. The accompaniment of homeownership to marriage

The transitions into marriage are usually concomitant with the transitions into homeownership. In particular, if renters tend to be matched with homeowners, then this will lead to a biased estimation on the homeownership effect to the household formation. However, this is unlikely a serious issue since it tends to underestimate the homeownership effect. To reflect a more real homeownership effect, we restrict homeowners to the individuals who are the registered owner of the house or whose parents are (registered homeowners henceforth). The results, as reported in column 1 of Table 4, show that the marriage rate of registered homeowners is 1.4 percentage points (compared to 1.0 percentage point reported in column (3) of Table 3) higher than that of renters. The difference in marriage probability between the two is

statistically significant at the 1% level. Therefore, the accompaniment of homeownership to marriage unlikely poses a threat to the homeownership effect on marriage.

** Table 4 is inserted into here **

5.2. Reverse causality of marriage to homeownership

The real estate literature has provided evidence that married people tend to own houses compared with those unmarried (Haurin and Rosenthal 2007). That is to say previous estimates could be biased because of the positive influence of marriage on the transitions into homeownership (Holland 2012). We now introduce two ways to avoid the potential reverse causality. First, the panel nature of the individual-level data will help mitigate the reverse causality issue by the use of the one year lagged term of homeownership¹. The results, after controlling for the one year lagged term of *Homeowner*, are reported in column (2) of Table 4. As we expected, homeowners on average are 1.4 percentage points more likely to get married, holding everything else constant. Second, we attempt to eliminate the potential reverse causality problem by excluding the observations that have a marriage before the transitions into homeownership. The results are reported in column (3) of Table 4. Again, we find that homeownership affects household formation. Everything else being equal, owning a home before marriage increases individual's marriage rate by 2.5 percentage points. This result suggests that including the sample of homeownership after marriage tends to underestimate the homeownership effect on marriage probability.

¹ We also perform the regressions using county-specific average homeownership rate, which are less likely to suffer from endogeneity problems. The results also do not change significantly compared to the previous estimates.

5.3. Model Misspecification

A key identification assumption of previous estimations is that all the covariates have linear impacts on the dependent variable. If the relation between dependent variables and the outcome variable is non-linear, our previous estimators may be biased. To mitigate this concern, we apply the propensity score matching (PSM) approach, the identification of which estimates a propensity score for all individuals based on the “distance” between treatment and control groups, and does not depend on the assumption of linear impacts of covariates.

In the PSM estimation for the homeownership effect on marriage, we match homeowners with renters by using the nearest neighbor matching with caliper and kernel matching algorithm respectively to find all matched pairs that have closest propensity score. The Average Treatment effect on the Treated (ATT), which has a similar interpretation to the marginal effect in the probit models that measures the difference in marriage probability between homeowners and renters, is then estimated using the sub-sample of matched samples. The estimation results of PSM models using the nearest neighbor matching algorithm are reported in column (1) to column (4) of Table 5, and the results using the algorithm are in column (5) to column (8). The estimated ATTs in all groups are consistent with our previous estimations. Compared to the renters, homeowners are associated with a higher rate of family formation, holding other things constant.

** Table 5 is inserted into here **

It is important to estimate the matching quality to assure that our PSM models are well identified. Specifically, below we check i) *the unconfoundedness condition* that

the relevant covariate X is the only source of selection bias and ii) *the common support condition* that the propensity score distribution between the treatment group and comparison group is overlapped.

The unconfoundedness condition: The distribution of covariates in both treated and untreated groups should be balanced after the matching procedure. As suggested by Rosenbaum and Rubin (1983), we must ensure that after matching on the propensity score, the set of observed covariates should be independent of the homeowner or renter status. The results of balancing test, as reported in Table 6, show that the difference in mean value of most covariates has a sharp decrease and become economically negligible after matching. For example, before matching, the difference in the educational attainment among these two groups in the full sample is 0.181; after matching, the difference shrinks to 0.017. This implies that after matching, the treatment group and the control group are comparable in most relevant characteristics, suggesting a good quality of the matching.

** Table 6 is inserted into here **

The common support condition: The PSM estimator is only defined in the region of common support (Dehejia and Wahba 2002; Heckman et al. 1997). The common support condition requires that any combination of observations in the treatment group can also be observed in the comparison group. Matching an incomparable comparison group to the treatment group could cause estimation bias. Hence, it is necessary to check the common support of the propensity scores for homeowners and renters. The most straightforward strategy to verify the common support condition is to analyze the density distribution of the propensity score for both homeowners and

renters. Figure 2 displays the propensity score distributions of home owners on the top, and that of the renters on the bottom in all groups. This figure show evidence of overlapping of the overwhelming majority of the propensity score distributions, implying that our PSM estimation is reliable.

** Figure 2 is inserted into here **

5.4. Omitted personality characteristics

There may exist personality characteristics that affect individual's attractiveness and are not controlled in previous estimations. To the extent that these personal features differ from homeowners and renters, our previous estimates may suffer from omitted variable biases. CFPS contains information on individual characteristics in six aspects, including understanding, health, clothing, appearance, intelligence, and expression. All these personality variables are measured into the scale of 1-7 and a larger value refers to a better status or higher ability. We present the descriptive statistics of personality characteristics between homeowners and renters in Table 7, and the results do suggest that homeowners have the advantage of personality characteristics over their rental counterparts in all aspects. The gaps are statistically significant at the 1% level.

To address this issue, we add indicator variables of personality characteristics into Equation (1) in sequence. We expect that individuals who have advantage of personality characteristics tend to have a higher marriage probability. Column (1) to (6) in Table 8 report the regression results after controlling for the three proxies of personality characteristics separately. As we expected, the marriage rate of individuals who have better personal features, including understanding, health, clothing,

appearance, intelligence, and expression, are higher than the rate of the others, other things being the same. Actually, the best way to eliminate this possibility is to control for all these personality characteristics in a regression, but this method does not work well considering the high collinearity among personality variables, as reported in Table 9. While we cannot control for the six personality variables in a model, we can nevertheless use principal component analysis to compress them into one component, and are then used as a control variable adding into the regression². We report the result using the principal component analysis in column (7) of Table 8.

Comparing the homeowner and renter difference in marriage rate presented in column (1) of Table 4, we can see it remains almost the same after controlling for the personality characteristics. This suggests that effort driven by the personality characteristics explains little of the difference in marriage probability between homeowners and renters.

** Table 7 is inserted into here **

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6. Further Empirical Findings: The Heterogeneity Effect By Gender, Age, Education and Marriage Market Conditions

Previous evidence shows a robust positive effect of homeownership on family formation. A further inquiry at this point would be to examine whether the homeownership effect on marriage is more prominent among some specific groups.

That is, is the marriage probability of certain groups of individuals more vulnerable to

² We retain only one component because the eigenvalue associated with the first component equals 4.49 while the eigenvalues associated with all other components are smaller than 0.61.

homeownership? In this section, we segment the samples restricted to registered homeowners into several subgroups based on gender, age, education attainment and regional sex ratio. As preliminary analyses, we use a simple t-test to investigate the unconditional marriage rate differences among homeowners for various subsamples. The results are displayed in Table 10. We find that owning a house has a larger positive effect for women, elderly people, low-educated people, and individuals in regions with highly skewed sex ratio. For example, the data shows that, unconditionally, female homeowners on average have 3.95 marriage rates higher than their female counterparts. The difference is statistically significant at the 1% level.

We further include interaction terms to control for homeownership and the potential more vulnerable groups. Other variables included in the equation are the same as those for the variables controlled in the baseline model. The results are displayed in Table 11. In line with results in preliminary analyses, we find that the interaction variables introduced to the equation have significantly positive effects. Specifically, the cross effect of homeowner and gender group indicates the homeownership effect is stronger for females (reported in column (1) of Table 11). This finding makes sense as it is consistent with the notion that women tend to value homeownership more highly than men do, and regard owning a house as a requisite for marriage (Wei et al. 2012). Compared with single female renters, single female homeowners would be less concerned about whether their potential partners own a house or not, which expands their choices of potential marriage partners beyond just male homeowners and thus increases their marriage probability. The cross effects of homeowner and age, as well as homeowner and education, suggest that the homeownership effect is more prominent among elderly people and low-educated people (presented in column (2) and (3) in Table 11). These findings also make sense

given that young people are more innovative, creative, and energetic and have more opportunities to enrich themselves than the elderly people, and thus innately have more value and potential. The importance of owning a home for the young is, therefore, not as great as it for the elderly in the marriage market. Similarly, people who receive higher education do not rely on homeownership as much as those with lower education since high educational attainment has positive social and economic effects on individuals (Dee 2004). The cross effect of homeowner and regional sex ratio demonstrates a more pronounced homeownership effect in regions with highly skewed sex ratio (shown in column (4) of Table 11). The difference in the homeownership effect among regions with different sex ratio is reasonable since the competitive pressure on the single adults increases with the expansion of sex ratio imbalance (Wei and Zhang 2011).

** Table 10 is inserted into here **

** Table 11 is inserted into here **

7. Conclusions

While the underlying theoretical underpinnings of the relations between homeownership and marriage are well-established, empirical assessments have received little attention so far. Besides, the existing research is far from reaching a consensus over whether owning a house may either increase or decrease the likelihood of entry into marriage. This study partially fills this gap in the literature by examining the homeownership effect on marriage in a major emerging market country. The historical tradition of valuing homeownership and the increasingly competitive marriage market due to rising sex ratio imbalance in China provide an opportunity to

certify whether unmarried people with homeownership are more attractive in the marriage market than those without.

Using data from the China Family Panel Studies for years 2010, 2012 and 2014, we find statistically significant relations between homeownership and marriage. Homeowners are 2.8 percentage points more likely to enter into marriage than renters, holding everything else equal. This gap remains significant after controlling for a rich set of household demographic and socio-economic characteristics, as well as county and year fixed effects. This finding is unlikely to be driven by the accompaniment of homeownership to marriage, reverse causality of marriage to homeownership, model misspecification, and unobservable personality characteristics. Closer examinations reveal a pronounced homeownership effect among certain groups. Specifically, We find that owning a house has a larger positive effect for women, elderly people, low-educated people, and individuals in regions with highly skewed sex ratio.

Findings in this paper carry broad policy implications. Previous evidence has documented numerous benefits associated with marriage. For example, marriage can increase the household's standards of living (Waite 1995), conduce to children's emotional and cognitive development (Thomson et al. 1994), lower the risk of delinquency, school dropout, and teenage pregnancy and childbearing (Lichter et al. 2002), and increase the productivity of men in the workplace (Gray 1997). Besides, enormous positive externalities brought by homeownership have led to a proliferation of legislated institutions and regulations that subsidize owner-occupied housing in various forms (Chen and Hu 2018). Evidence in this paper shows a positive effect of homeownership on marriage. This provides a new justification of policies or reforms intended to make homeownership easier.

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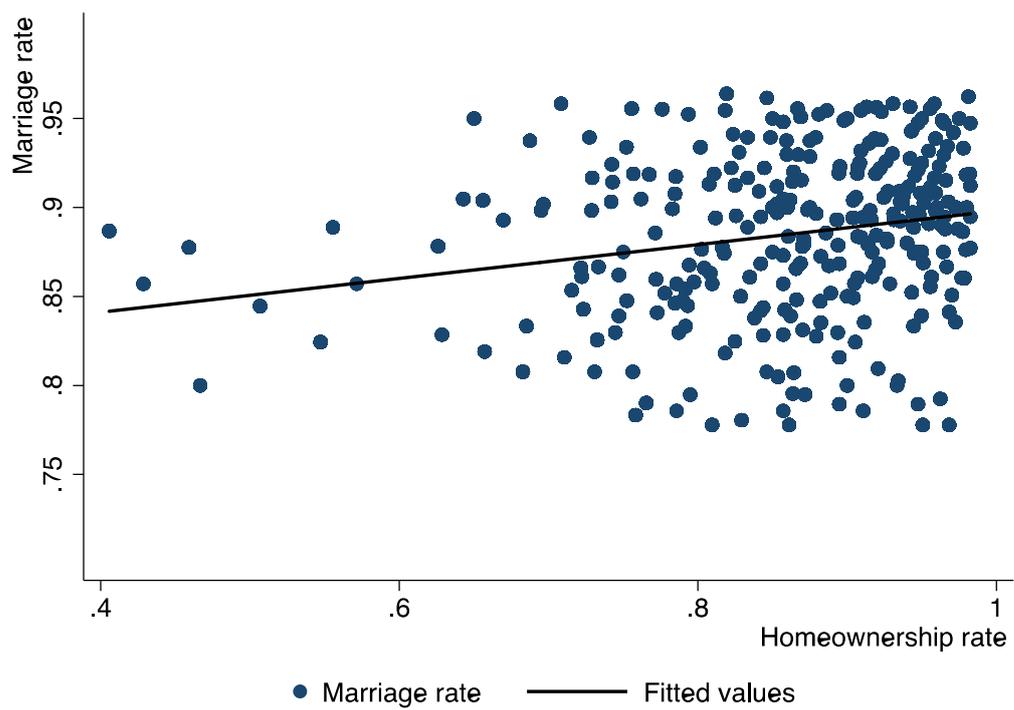
TABLES AND FIGURES

Table 1 Definitions of variables

Variables		Definitions
Dependent variable	Married	An indicator variable of marriage, which equals to one if the marital status in the survey is married, and equals to zero otherwise
Independent variable	Homeowner	An indicator variable of people who own a home
Control variables	Highest educational attainment	Highest educational level of individuals
	Primary school and below	An indicator variable of people with a highest educational level of primary school and below
	Middle & high school	An indicator variable of people with a highest educational level of middle & high school
	Three-year college	An indicator variable of people with a highest educational level of three-year college
	Four-year college and above	An indicator variable of people with a highest educational level of college and above
	Age	Age of individuals
	Aged between 22 and 30	An indicator variable of people aged between 22 and 30
	Aged between 31 and 40	An indicator variable of people aged between 31 and 40
	Aged between 41 and 50	An indicator variable of people aged between 41 and 50
	Aged above 51	An indicator variable of people Aged above 51
	Female	An indicator variable of people being female
	Urban native	An indicator variable of people with an urban native hukou
	Han nationality	An indicator variable of people whose nationality is Han
	Communist	An indicator variable of members of the Communist Party of China
	Household income	Total household income, measured as # yuan

Note:

- 1). There are eight categories in education: 1 = illiterate; 2 = primary school; 3 = middle school; 4 = high school; 5 = three-year college; 6 = four-year college; 7 = master's degree; 8 = doctoral degree.
- 2). We exclude people aged below 22 and above 60 in 2010 because analysis in this paper focuses on individual's marriage choice and the legal marriage age is 22 or older for male and 20 or older for female in China.



Data Source: China Family Panel Studies 2010, 2012 and 2014

Figure 1 Homeownership rate and marriage rate

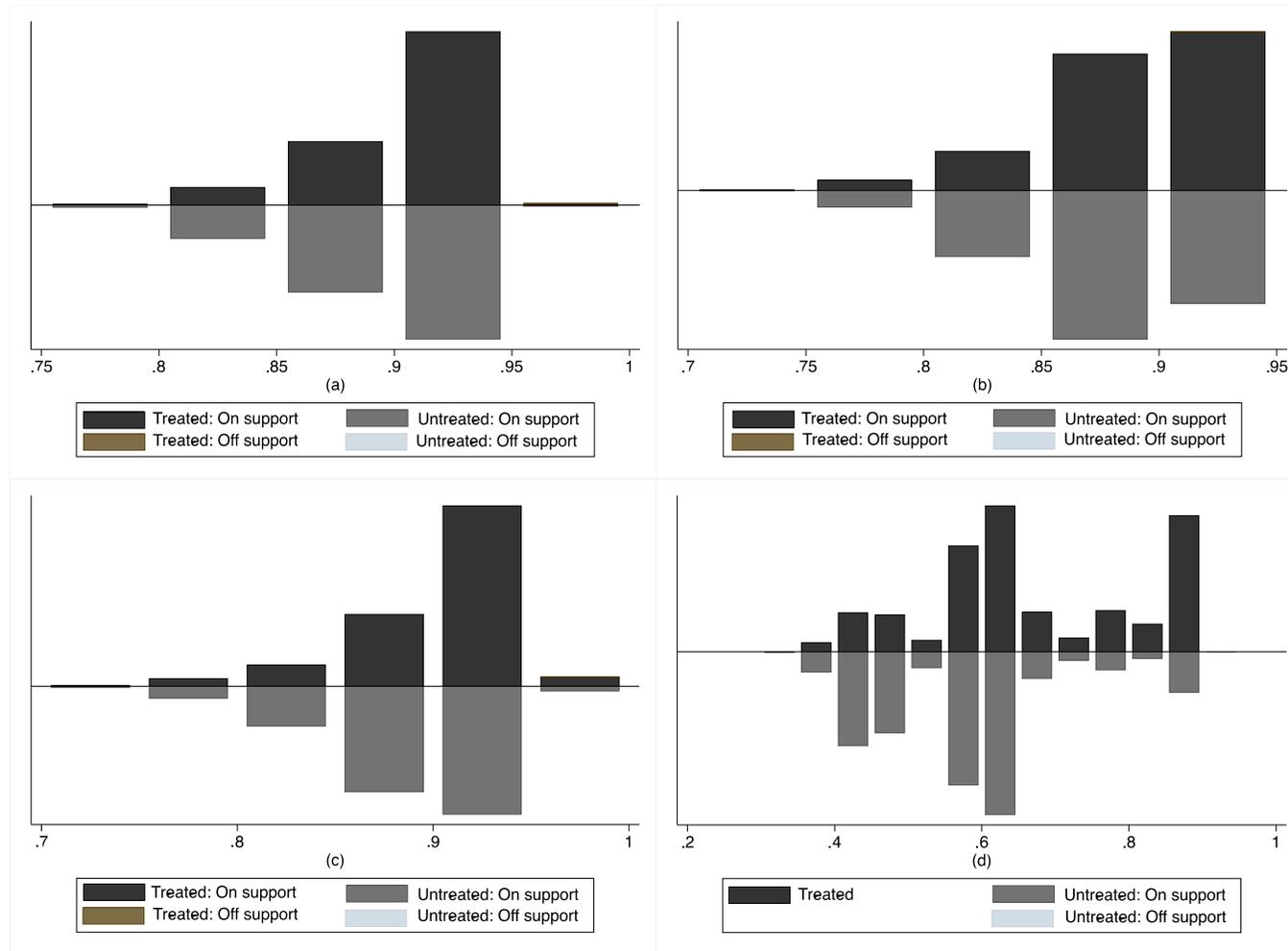


Figure 2 The propensity score distribution of home owners and renters

Table 2 Summary statistics

Variables	Full sample		Homeowners		Renters		The differences
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Homeowner	0.865	0.342					
Married	0.891	0.312	0.896	0.305	0.857	0.350	0.039***
Highest educational attainment							
Primary school and below	0.212	0.409	0.214	0.410	0.200	0.400	0.014*
Middle & high school	0.527	0.499	0.519	0.500	0.578	0.494	-0.059***
Three-year college	0.163	0.370	0.168	0.374	0.136	0.343	0.032***
Four-year college and above	0.098	0.297	0.100	0.300	0.086	0.281	0.014***
Age							
Aged between 22 and 30	0.122	0.328	0.118	0.323	0.150	0.357	-0.032***
Aged between 31 and 40	0.235	0.424	0.229	0.420	0.277	0.448	-0.048***
Aged between 41 and 50	0.303	0.459	0.305	0.460	0.287	0.452	0.018**
Aged above 51	0.339	0.474	0.348	0.476	0.287	0.452	0.061***
Female	0.526	0.499	0.528	0.499	0.516	0.500	0.012
Urban native	0.491	0.500	0.485	0.500	0.531	0.499	-0.046***
Han nationality	0.948	0.222	0.949	0.221	0.946	0.227	0.003
Communist	0.320	0.466	0.337	0.473	0.210	0.407	0.127***
Household income	51,869	42,425	52,472	42,218	48,536	43,736	3,936***
Observations		62,385		53,963		8,422	

Note:

- 1). Household income is measured as # yuan.
- 2). We exclude people aged below 22 and above 60 in 2010 because analysis in this paper focuses on individual's marriage choice and the legal marriage age is 22 or older for male and 20 or older for female in China.
- 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
- 4). Data source: China Family Panel Studies 2010, 2012 and 2014.

Table 3 The impact of homeownership on marriage (estimated by probit models)

	(1)		(2)		(3)	
	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect
Homeowner	0.151*** (0.029)	0.028	0.133*** (0.028)	0.021	0.068** (0.028)	0.010
Highest educational attainment						
Primary school and below (ref)						
Middle & high school			-0.009 (0.023)	-0.001	0.046** (0.021)	0.006
Three-year college			-0.221*** (0.035)	-0.037	-0.113*** (0.034)	-0.017
Four-year college and above			-0.348*** (0.040)	-0.064	-0.302*** (0.040)	-0.051
Age						
Aged between 20 and 30 (ref)						
Aged between 31 and 40			0.954*** (0.029)	0.101	1.000*** (0.030)	0.097
Aged between 41 and 50			1.102*** (0.030)	0.130	1.167*** (0.031)	0.128
Aged above 51			0.893*** (0.029)	0.112	0.974*** (0.031)	0.113
Female			0.199*** (0.019)	0.030	0.211*** (0.019)	0.030
Urban native			-0.163*** (0.023)	-0.026	-0.063** (0.025)	-0.009
Han nationality			0.068* (0.039)	0.011	-0.054 (0.042)	-0.007
Communist			-0.014 (0.027)	-0.002	0.106*** (0.029)	0.014
Ln(Household income)			0.083*** (0.007)	0.012	0.099*** (0.007)	0.014
Year dummies		No		No		Yes
County dummies		No		No		Yes
Pseudo R2		0.0011		0.1007		0.1317
Observations		62,385		62,385		62,385

Note:

- 1). The dependent variable is an indicator of married people.
- 2). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
- 3). Robust standard errors clustering by location and by year are given in parentheses.
- 4). The marginal effect of a dummy variable measures the impact of a discrete change of the dummy variable from 0 to 1.

Table 4 The impact of homeownership with different definitions and restricted samples (estimated by probit models)

	(1)		(2)		(3)	
	Registered homeowners and renters		Two-year lagged homeowner		Exclusion of homeownership after marriage	
	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect
Homeowner					0.140*** (0.048)	0.025
Registered homeowner	0.099*** (0.029)	0.014				
L2.Homeowner			0.091** (0.036)	0.014		
Control variables		Yes		Yes		Yes
Year dummies		Yes		Yes		Yes
County dummies		Yes		Yes		Yes
Pseudo R2		0.1504		0.1094		0.1465
Observations		52,700		41,470		9,188

Note:

- 1). The dependent variable is an indicator of married people.
- 2). Sample in column (1) is restricted to renters and homeowners who are the registered owners of the home or whose parents are; L2.Homeowner refers to the two-year lagged term of homeowner in column (2); Sample of homeowners who obtain their home after marriage is excluded in column (3).
- 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
- 4). Robust standard errors clustering by location and by year are given in parentheses.
- 5). Control variables include education, age, gender, hukou, nationality, political status, and household income.
- 6). The marginal effect of a dummy variable measures the impact of a discrete change of the dummy variable from 0 to 1.

Table 5 The impact of homeownership on marriage (estimated by propensity score matching method)

	Nearest neighbor matching				Kernel matching			
	Full sample	Registered homeowners and renters	Two-year lagged homeowner	Exclusion of homeownership after marriage	Full sample	Registered homeowners and renters	Two-year lagged homeowner	Exclusion of homeownership after marriage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Homeowner	0.012*** (0.005)			0.003 (0.008)	0.011*** (0.005)			0.003 (0.008)
Registered homeowner		0.018*** (0.005)				0.015*** (0.005)		
L2.Homeowner			0.021*** (0.006)				0.020*** (0.006)	
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62,385	52,700	41,470	9,188	62,385	52,700	41,470	9,188

Note:

- 1). The dependent variable is an indicator of married people.
- 2). Sample in column (2) and (6) is restricted to renters and homeowners who are the registered owners of the home or whose parents are; L2.Homeowner refers to the two-year lagged term of homeowner in column (3) and (7); Sample of homeowners who obtain their home after marriage is excluded in column (4) and (8).
- 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
- 4). Standard errors are given in parentheses.
- 5). Control variables include education, age, gender, hukou, nationality, political status, and household income.

Table 6 Balancing quality of kernel matching

		(a): Full sample			(b): Registered homeowners and renters			(c): Two-year lagged homeowner			(d): Exclusion of homeownership after marriage		
		Mean		Diff.	Mean		Diff.	Mean		Diff.	Mean		Diff.
		Treated	Control		Treated	Control		Treated	Control		Treated	Control	
Education	Unmatched	3.071	3.252	0.181	3.001	3.252	0.251	3.316	3.539	0.223	3.181	3.078	0.103
	Matched	3.072	3.089	0.017	3.003	3.082	0.079	3.319	3.353	0.034	3.181	3.228	0.047
Age	Unmatched	45.189	43.481	1.708	45.318	43.481	1.837	46.550	44.582	1.968	43.470	41.490	1.980
	Matched	45.177	44.068	1.109	45.301	44.148	1.153	46.521	45.381	1.140	43.470	42.685	0.785
Female	Unmatched	0.523	0.514	0.009	0.522	0.514	0.008	0.524	0.512	0.012	0.507	0.507	0.000
	Matched	0.523	0.517	0.006	0.522	0.516	0.006	0.523	0.517	0.006	0.507	0.491	0.016
Urban native	Unmatched	0.240	0.360	0.120	0.241	0.360	0.119	0.234	0.376	0.142	0.255	0.388	0.133
	Matched	0.241	0.254	0.013	0.242	0.255	0.013	0.234	0.263	0.029	0.255	0.254	0.001
Han Nationality	Unmatched	0.915	0.918	0.003	0.923	0.918	0.005	0.914	0.931	0.017	0.908	0.921	0.013
	Matched	0.915	0.913	0.002	0.923	0.917	0.006	0.915	0.923	0.008	0.908	0.907	0.001
Communist	Unmatched	0.315	0.243	0.072	0.284	0.243	0.041	0.440	0.340	0.100	0.360	0.122	0.238
	Matched	0.314	0.266	0.048	0.283	0.264	0.019	0.439	0.379	0.060	0.360	0.361	0.001
Ln(Household income)	Unmatched	10.128	10.203	0.075	10.120	10.203	0.083	10.316	10.398	0.082	10.110	10.063	0.047
	Matched	10.128	10.153	0.025	10.120	10.160	0.040	10.317	10.343	0.026	10.110	10.152	0.042

Note:

1). Diff. refers to the mean value differences between treatment and control groups.

2). There are eight categories in education: 1 = illiterate; 2 = primary school; 3 = middle school; 4 = high school; 5 = three-year college; 6 = four-year college; 7 = master's degree; 8 = doctoral degree.

Table 7 Summary statistics of personality variables

Variables	Definitions	Registered homeowners		Renters		The differences
		Mean	Std. Dev.	Mean	Std. Dev.	
Understanding	Respondent's comprehension ability	5.859	1.039	5.817	1.032	0.042***
Health	Respondent's health status	5.880	1.002	5.839	0.999	0.041***
Clothing	Neatness/cleanliness of respondent's clothing	5.852	1.010	5.819	0.987	0.033***
Appearance	Respondent's appearance	5.753	1.031	5.691	1.004	0.062***
Intelligence	Respondent's intelligence	5.810	1.025	5.746	1.005	0.064***
Expression	Respondent's language ability with respect to self-expression	5.603	1.149	5.531	1.047	0.072***
Observations		44,278		8,422		

Note:

- 1). All personality variables are measured into a scale of 1-7 and a larger value refers to a better status or higher ability.
- 2). Sample is restricted to renters and homeowners who are the registered owners of the home or whose parents are.
- 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8 The impact of homeownership with additional controls (estimated by probit models)

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Coef.	Marginal Effect												
Registered homeowner	0.101*** (0.030)	0.014	0.100*** (0.030)	0.014	0.102*** (0.029)	0.014	0.101*** (0.030)	0.014	0.101*** (0.030)	0.014	0.104*** (0.030)	0.014	0.103*** (0.030)	0.014
Understanding	0.032*** (0.009)	0.004												
Health			0.045*** (0.010)	0.006										
Clothing					0.033*** (0.010)	0.004								
Appearance							0.039*** (0.010)	0.005						
Intelligence									0.031*** (0.009)	0.004				
Expression											0.029*** (0.009)	0.004		
Component													0.023*** (0.005)	0.003
Control variables	Yes													
Year dummies	Yes													
County dummies	Yes													
Pseudo R2	0.1319		0.1322		0.1318		0.1320		0.1318		0.1318		0.1320	
Observations	52,700		52,700		52,700		52,700		52,700		52,700		52,700	

Note:

- 1). The dependent variable is an indicator of married people.
- 2). Sample in column (1) to (7) is restricted to renters and homeowners who are the registered owners of the home or whose parents are.
- 3). * p < 0.1, ** p < 0.05, *** p < 0.01.
- 4). Robust standard errors clustering by location and by year are given in parentheses.
- 5). Control variables include education, age, gender, hukou, nationality, political status, and household income.

Table 9 Correlation matrix of personality variables

	Understanding	Health	Clothing	Appearance	Intelligence	Expression
Understanding	1.000					
Health	0.759***	1.000				
Clothing	0.754***	0.792***	1.000			
Appearance	0.731***	0.786***	0.855***	1.000		
Intelligence	0.796***	0.733***	0.757***	0.764***	1.000	
Expression	0.544***	0.496***	0.521***	0.516***	0.579***	1.000

Note:

- 1). All personality variables are measured into a scale of 1-7 and a larger value refers to a better status or higher ability.
- 2). Sample is restricted to renters and homeowners who are the registered owners of the home or whose parents are.
- 3). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10 Summary statistics of marriage rate in different groups

Male homeowners			Female homeowners			
Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	The differences
24,463	93.03%	0.255	22,417	89.08%	0.312	3.95% (***)
Homeowners aged above 40			Homeowners aged below 40			
Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	The differences
32,797	94.58%	0.226	14,083	83.14%	0.374	11.45% (***)
Homeowners with primary school or below education			Homeowners with middle school or above education			
Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	The differences
16,729	93.20%	0.252	30,151	90.01%	0.300	3.19% (***)
Homeowners in regions with highly skewed sex ratio			Homeowners in regions with non-skewed or less-skewed sex ratio			
Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	The differences
7,194	90.71%	0.290	24,569	90.08%	0.299	0.64% (*)

Note:

- 1). Homeowners refer to the individuals who are the registered owner of the home or whose parents are.
- 2). We exclude people aged below 22 and above 60 in 2010 because analysis in this paper focuses on individual's marriage choice and the legal marriage age is 22 or older for male and 20 or older for female in China.
- 3). We label the sex ratio of a region as highly skewed if its sex ratio is in the top ten percentile and bottom ten percentile of the sex ratio distribution; we calculate the sex ratio as the ratio of unmarried men to unmarried women within a region.
- 4). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 11 Difference in the impact of homeownership among groups (estimated by probit models)

	(1)		(2)		(3)		(4)	
	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect	Coef.	Marginal Effect
Registered homeowner * Female	0.139*** (0.048)	0.018						
Registered homeowner * Aged above 40			0.233*** (0.046)	0.032				
Registered homeowner * Low educated					0.136** (0.060)	0.017		
Registered homeowner * highly skewed sex ratio							0.165* (0.090)	0.024
highly skewed sex ratio							-0.134* (0.081)	-0.022
Control variables		Yes		Yes		Yes		Yes
Year dummies		Yes		Yes		Yes		Yes
County dummies		Yes		Yes		Yes		Yes
Pseudo R2		0.1318		0.1323		0.1319		0.1319
Observations		52,700		52,700		52,700		52,700

Note:

- 1). The dependent variable is an indicator of married people.
- 2). Low educated is an indicator variable of people with a highest educational level of primary school and below; skewed sex ratio is an indicator variable, which equals to one for a region with the value in the top ten percentile and bottom ten percentile of the sex ratio distribution, and equals to zero otherwise; We calculate the sex ratio as the ratio of unmarried men to unmarried women within a county.
- 3). Sample in column (1) to (4) is restricted to renters and homeowners who are the registered owners of the home or whose parents are.
- 4). * p < 0.1, ** p < 0.05, *** p < 0.01.
- 5). Robust standard errors clustering by location and by year are given in parentheses.
- 6). Control variables include homeowner, education, age, gender, hukou, nationality, political status, and household income.