

Article

Chinese Housing Reform and Social Sustainability: Evidence from Post-Reform Home Ownership

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Abstract: Since 1978, China has undergone an institutional reform, from a welfare-oriented housing allocation system to a market-oriented one. But with high housing prices, affordability is a major obstacle to home ownership for Chinese citizens. Now, the government has started to change the goal of housing policy from present economic benefits to sustainable housing, so future generations will have a decent place to live. Housing is an important indicator for social stratification, and home ownership, which is an important component of social sustainability in the Chinese context, is influenced by multiple factors that vary across countries. Although China has a long tradition of home ownership, there is a lack of comprehensive research on post-reform housing inequality. By undertaking a large-scale field study in the city of Xiamen, our research explored to what extent home ownership varies across socio-economic classes, and improves understanding of the reasons behind home ownership inequality. It was discovered that people have a variety of resources from which housing can be obtained, and that commercial housing served as the primary housing source, although, due to path dependence, public housing still comprises an important source of housing, as well as self-built houses. A structural equation model (SEM) was used to further explore the driving forces of home ownership inequality. The model indicated that hukou (household registration) status has the strongest effect on home ownership, followed by education, with family income and occupation as less important factors. Along with income and education, home ownership has a direct effect on people's perception of their own socio-economic status (SES). A probability model of home ownership was developed, based on logistic regression. Local families with higher levels of income and education with at least one member working in a publicly owned organization had a higher probability of home ownership. Lastly, since 1999, housing reform in Xiamen has tended to increase social stratification, with negative economic and social consequences. Therefore, policies should pay more attention to the welfare of renters and integrating the migration process into urban planning.

Keywords: housing reform; sustainable housing policy; social stratification; home ownership; China

1. Introduction

Sustainable development entered the global arena after the United Nation's published a report entitled "World Commission on Environment and Development" (WCED). Although there is no consensus on the definition of social sustainability, it includes a concern for a broad spectrum of issues, ranging from basic and tangible requirements—such as potable water, wholesome food, health care, and housing—to less tangible needs concerning education, employment, economic equity, and social justice [1]. Social sustainability involves the promotion of social harmony and equity, avoids social dysfunction, and improves the quality of life for all segments of the population, while a stratified society is expected to be less cohesive [2–6]. In the context of housing, social sustainability enables

the equitable distribution of resources and opportunities [7] and echoes the principles of sustainable development defined by the WCED [3]. Urban sustainability can only gain traction if sustainable housing is achieved [8].

Global housing policy can be dated back to the reconstruction work after World War II, when the World Bank encouraged permanent housing for rent. Today, most developed countries have mature housing markets that are a major driver of economic growth [9,10]. However, global housing policy experiences severe challenges due to migration, unemployment, and urban shrinkage [11–13]. Since 1949, China has made great efforts to solve its housing shortage and improve living standards and citizen welfare. During the period of planned economy, along with salary, a state-owned house and a comprehensive package of welfare services were provided to all employees working in state-owned (or “publicly owned”) organizations. We refer to this kind of housing provision as a welfare-oriented housing allocation. “Publicly owned organization” is a generic term denoting the socialist working place in Communist China, including government departments, public institutions (non-profit organizations engaged in healthcare, education, research, cultural activities, and so on), and state-owned enterprises. A process of housing reform began in the late 1970s, during a period of social transition and economic reform. From the 1970s to the 1980s, the welfare-oriented housing allocation system gradually gave way to a new market-oriented system [14], and in the 1990s, welfare houses were sold to local workers at subsidized prices. Since then, a largely free-market housing system has been in operation. Although home ownership has been transferred from state-owned organizations to the individual, the price mechanism of the welfare houses can be contrasted with that of commercial houses. The price of welfare houses is determined by the government and based on construction costs, while the price of commercial houses is determined by the market and includes real estate business profits. As a result, we continue to refer to the sold-off welfare houses as “public houses”. Since 2000, reduced government control over the housing system has led to a boom in real estate development. Commercial housing is now extremely expensive, with very high price-to-income ratios compared with many other countries [15]. Consequently, affordability is now a major obstacle to home ownership for Chinese citizens.

China has been transformed from one of the most egalitarian countries in the world to a country with one of the highest levels of social inequality [16]. Issues related to post-reform housing have been important subjects for researchers because China has effectively become a laboratory for institutional transitions. Researchers have assessed the impacts of post-reform housing policy on Chinese transportation, urban environments, the economy, and spatial patterns [17–23]. Furthermore, many environmental impacts have been associated with the intensive development of commercial houses [17,18]. The housing reform has caused a spatial imbalance between work and housing, increasing commuting times, and even reshaping the urban form [19–22]. Although the housing reform has provided significant economic benefits [23], there is still a need for affordable housing for the urban poor [24,25]. The housing reform paralleled economic change in China. The reduced welfare system released the great burden of state-owned housing and improved economic efficiency. However, the goal of housing policy in China has started to change from immediate economic benefits to that of sustainability. The most important difference between “immediate economic benefits” and “sustainable housing” is that the first ignores future benefits and costs, while the second seeks to include them. This strategy has the potential to ensure that all generations will have opportunities for quality housing [26]. Therefore, there is a need to assess the housing reform from a social perspective, although this is an emerging area of research.

China has some of the highest rates of home ownership [27]. Owning one’s own house is a fundamental desire for some young couples who want to marry [28]. In addition, accessing public services can often be tied to home ownership in China. For example, home ownership is a prerequisite for children attending the school that corresponds to their neighborhood, which is one reason why housing prices have become inflated in school districts perceived to have better educational resources, which then limits access of renters to such schools. Furthermore, home ownership may generate

positive externalities. Homeowners tend to be more involved in social affairs because home ownership gives them a sense of belonging and satisfaction, as well as incentives to create social capital [28]. Therefore, home ownership can serve as an essential ingredient for social sustainability in China.

Housing is also an important factor in social stratification [29]. While China's welfare-oriented housing system displayed relative homogeneity before the housing reform [30], housing inequality has significantly increased since the change to a market-based system. However, the causes of housing inequality have not been investigated in detail. Home ownership is influenced by multiple factors [31–34]. A household's financial condition (income, mortgage, and pension), employment history, intergenerational transfer, family structure (a family's life-cycle course, size, and marital status), education, and individualism are all factors that influence the various rates of home ownership in developed countries. Research on social sustainability in China has principally focused on the home ownership inequality between urban and migrant households [35,36]. The hukou (household registration) system traditionally differentiated the local population from the migrant population. Only local population were qualified to purchase houses in some cities, greatly restricting the housing choices of renters [37]. Although the role of hukou in creating social exclusion has declined [38], it significantly contributes to home ownership inequality [39]. Other researchers have explored the link between home ownership and education as well as occupation, and found that, between 2000 and 2010, housing inequality across education groups was rapidly rising, but remained the same across occupational groups [27]. Income and wealth were emphasized as being the most important driving forces for housing inequality, and the influence of family size has also been addressed [27]. A significant home ownership inequality existed among different social strata, with those on higher rungs of the social-economic ladder having a better housing condition than those at the bottom. Due to data limitations, the considered factors were usually analyzed individually, rather than exploring the multidimensional causes of inequality in home ownership. Previous research has not addressed the causal relationship between home ownership and socio-economic class, and the importance of each potential influencing factor remains uncertain. It is impossible to understand home ownership inequality and provide effective government intervention without first understanding the contributions of all the influencing factors.

A variety of factors, summarized as household characteristics, economic factors, and institutional factors, contribute to home ownership. Based on previous research and the housing reform background of China, we hypothesized that household characteristics (family size and education), economic factors (income), and institutional factors (hukou and occupation) influenced homeownership together (Hypothesis 1). An index of a self-rated socio-economic status (SES) was used to identify social stratification. Previous studies identified income and education as the most important factors influencing SES [40,41]. Considering the situation in China, we also hypothesized that home ownership inequality has led to self-rated SES differentiation in post-reform China (Hypothesis 2). We explored these two hypotheses by establishing a structural equation model. In this article, we also use logistic regression to specifically address the following questions: (1) How have demography and institutional transition influenced home ownership in the post-reform period? (2) How and to what extent does home ownership inequality vary across socio-economic classes?

This research provides a comprehensive perspective for addressing the problems of housing inequality, and the implications this may have for policy making to achieve a sustainable housing market. The framework of the paper is illustrated in Figure 1.

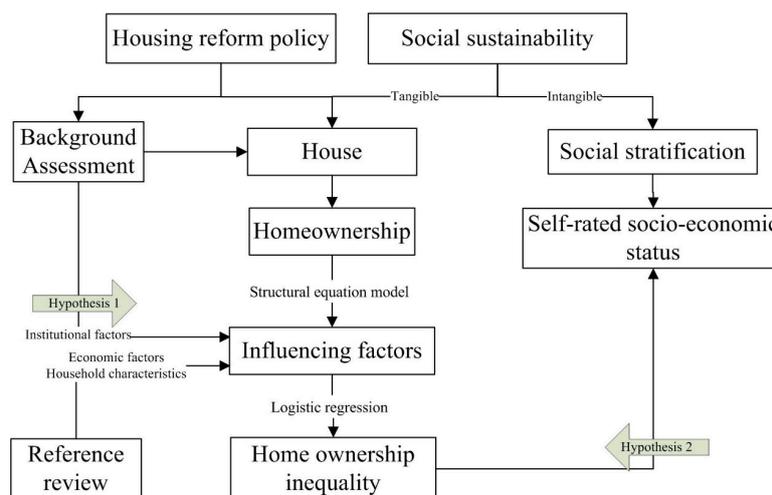


Figure 1. Research framework.

2. Study Area and Methodology

2.1. Study Area

The research was conducted in Xiamen, a rapidly urbanizing coastal city in Southeast China, with an administrative area of 1573 km² and a resident population in 2012 of 3.67 million. Since being designated as a Special Economic Zone (SEZ) in the 1980s, Xiamen has undergone rapid economic development and has now become a center for international tourism. GDP per capita is now approximately US \$11,000, about 20 times higher (inflation adjusted) than when the SEZ was established. Between 1984 and 2012, the urbanization rate steadily increased from 38.5% to 80.5%. The rapid development of Xiamen serves as a demonstration of China's economic reform [42]. According to the Xiamen City Chronicle, 1.167 million m² of welfare housing has been sold at a total price of 250 million RMB, with the last of the welfare houses sold into the market in 1997. No welfare housing has been built by any publicly owned organization since then. Evidence of improved living conditions is seen in the increase in floor area, per capita, of residential housing, which has risen from 3.94 m² in 1976 to 25.16 m² in 2012. At present, Xiamen's housing market is well known for its high housing prices (fourth highest of China's 284 prefecture cities) and its rapid growth rate (second highest of China's 284 prefecture cities).

2.2. Survey Design

China's rapid urbanization process has resulted in diverse urban communities. A multi-object spatial sampling method was introduced to obtain representative communities. The theoretical basis for spatial sampling is to determine the optimal relationship between estimation error, sampling density, and spatial arrangement of samples, in the spatial context for objects that are distributed continuously or discretely in space, through direct or indirect estimating approaches [43]. This method has been used for sampling and statistical inference in environment, resources, land, ecological, social, and economic sciences. This study considered population density, landforms, and benchmark land price. If a specific zone is diverse and complex in land price, population density, and landforms, the variance is large, and there would be more sampling communities. As a result, the self-selection problem can be avoided, making the observed results more convincing. This method was chosen for its higher precision, given the budget limitations of the survey [44,45]. The sampling was implemented using a professional spatial sampling and statistical inference tool [46]. Some 30 sample communities were eventually selected, and 1090 households were randomly selected from these communities, of which, 1075 of these households granted us permission to conduct a face-to-face survey (Figure 2). Xiamen was categorized into peri-urban, ex-urban, and urban core areas, according to the extent of

urbanization. The respondents accounted for 0.9% of the total households in the core area of the city. The survey was conducted by research staff in October 2012. The questionnaire was implemented on a household basis and included household demographic information, such as family income.

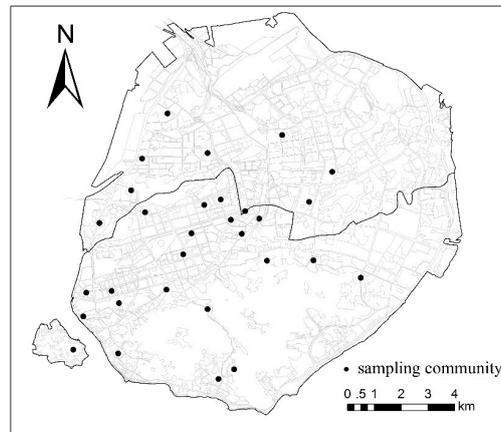


Figure 2. Location of sampling communities.

3. Statistical Methods

3.1. Structural Equation Model (SEM)

A structural equation model (SEM) is a statistical technique for testing and estimating causal relations, that uses a combination of statistical data and qualitative causal assumptions [46]. SEM results show the direct and indirect effects of independent variables on dependent variables. We applied SEM to analyze the formation of home ownership, basing our analysis on the cross-sectional dataset of 1075 Xiamen households. The database was created in SPSS 22.0 (SPSS Statistics 22.0, IBM: Armonk, NY, USA, 2013) and then imported into AMOS 16.0 (SPSS Amos 16.0., IBM: Armonk, NY, USA, 2007), which was used to establish the SEM [47]. Based on the literature review, household characteristics, economic factors, and institutional factors were considered in the exploration of factors that influence homeownership. The paper established two a priori models to represent Hypothesis 1 and Hypothesis 2 (Figure 3). Various measures exist to assess the goodness-of-fit of a SEM. These include chi-square (χ^2), goodness of fit index (GFI), comparative fit index (CFI), normed fit index (NFI), and Akaike information criterion (AIC). Chi-square reflects the distance between the sample covariance matrix and the theoretical covariance matrix, based on the hypothesized model; the higher the p -value of χ^2 , the better the overall goodness-of-fit.

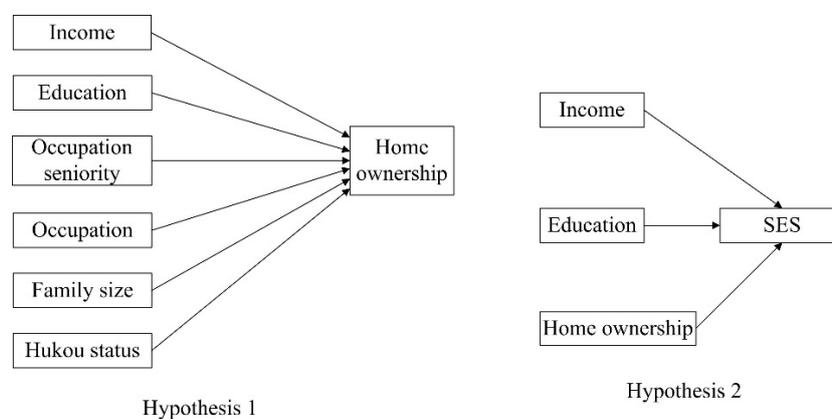


Figure 3. The a priori models of Hypothesis 1 and Hypothesis 2.

Latent variables are shown as manifest variables in rectangles. Arrows represent causal influences. The model on the left represents the relationship between home ownership and its influencing factors. The model on the right represents the relationship between SES and its influencing factors.

3.2. Logistic Regression

Logistic regression is a probabilistic statistical classification model that is used to predict the outcome of a categorical-dependent variable based on one or more predictor variables [48]. Compared to other multivariate statistical methods, logistic regression does not restrict the type of variables that are used. In addition, the variables do not necessarily have a normal distribution. Logistic regression analysis was conducted to further reveal the housing stratification across different groups. Home ownership probability was the dependent variable, whereas the independent variables were the factors from the SEM. We used this method to associate home ownership with factors deduced from the SEM. The function can be expressed as follows:

$$p = \frac{\exp(b_0 + b_1x_1 + b_2x_2 + \dots + b_px_p)}{1 + \exp(b_0 + b_1x_1 + b_2x_2 + \dots + b_px_p)}, \quad (1)$$

where p is the probability of home ownership occurring. If one owns one's home, the value is 1, and if not, the value is 0. The factor b_0 is an intercept, $x_0 \sim x_p$ are independent variables representing factors that influence home ownership, and $b_0 \sim b_p$ are the regression coefficients for independent variables. Exponent (\exp) b_i is an exponential function of b_i . As an odds ratio (OR), $\exp b_i$ represents the strength of the correlation between the factors and the home ownership. When $OR > 1$, a positive correlation exists between the factors and the occurrence probability, while $OR < 1$ indicates a negative correlation. When $OR = 1$, the factors are not correlated with the event.

This validation test uses receiver operating characteristic (ROC) to measure the relationship between the changes that result from the simulation and the actual changes. ROC is an indicator of goodness-of-fit, and it measures the area beneath the curve, which relates the true positive proportion to the false positive proportion for a range of cut-off values in classifying probability. The value of the area under the ROC curve (AUC) ranges from 0.5 to 1.0, with an ideal model having an area of 1.0 [48].

4. Results and Discussion

4.1. Characteristics of Respondents

The housing resources and socio-economic characteristics of sampled households are shown in Table 1. In the survey, 74.5% of respondents were aged between 25 and 60, and 66.6% had completed more than nine years at school. A nuclear family with 3–4 persons accounted for 65.3% of respondents, and 62.3% had a household income of 2000–10,000 RMB per month. Some 67.9% of respondents worked as general staff, 16.9% were low-level managers, 9.8% were middle managers, and 5.3% were higher-level managers. About 19.0% of respondents reported they had a low or very low SES, 9.9% had high or very high SES, and the majority felt they had average SES. China's hukou system traditionally determined where people had the right to live and work. People with household registration certificates from Xiamen were classified as local population (and represented 52% of respondents), while the remainder were classified as migrants.

Public organizations used to be the basic organizational unit in urban China, integrating all economic activities, social activities, and political control. Since the economic reforms that began in the late 1970s, however, the dominance of public organizations has been diminished, while privately owned firms have emerged and now employ an increasingly large share of the work force. Only 25.3% of the respondents worked in public organizations, while the remainder worked in various kinds of private organizations. The 3.1% of respondents who were temporary workers or unemployed were included in the latter group.

Table 1. Housing resources and socio-economic characteristics in sampled households.

Variable	Variable Description	Mean/Percentage
Age	1: ≤24, 2: 25–30, 3: 31–40, 4: 41–50, 5: 51–60, 6: ≥60	3.01
Gender	Male	49.13%
	Female	50.87%
Marital status	Unmarried	25.21%
	Married	73.65%
	Divorced	1.14%
Monthly family income RMB	1: ≤2000, 2: 2001–5000, 3: 5001–10,000, 4: 10,001–20,000, 5: >20,000	2.30
Education	1: 6 years or less, 2: 7–9 years, 3: 10–12 years, 4: 13–16 years	2.96
With/without Xiamen hukou	Migrant population	47.7%
	Local population	52.3%
Family size	1: 1 person, 2: 2 persons, 3: 3 persons, 4: 4 persons, 5: 5 persons	3.43
Occupation	State-owned organization	25.3%
	Foreign-funded firm or joint venture; Other	7.4%
	Privately owned firms	46.0%
	Self-employed	18.2%
	Temporary worker	3.1%
Occupational seniority	1: general staff, 2: low-level manager, 3: middle manager, 4: high-level manager	1.52
Socio-economic status (SES)	1: very low, 2: low, 3: average, 4: high, 5: very high	2.78
Home ownership	Rent self-built house	8.42%
	Rent public house	13.57%
	Rent commercial house	13.68%
	Self-built house	5.96%
	Purchase public house	23.74%
	Purchase commercial house	34.15%
Number of houses	1: none, 2: one, 3: two, 4: 3 or more	1.72

The percentage of respondents who owned their homes was 60.34%. Residents had various ways to obtain housing. These included public housing (33.44%), commercial housing (56.03%), and self-built housing (10.53%). Although no new public housing has been built since 1999, about one-third of residents still lived in a house that used to be publicly owned. Some 58.2% of respondents had at least one house. Of these respondents, 79.28% had one house, 17.29% had two houses, and 3.43% had three or more. Of the respondents who were tenants, 38.05% rented public housing, 38.35% rented commercial housing, and 23.6% rented self-built housing. Self-built housing was constructed by individuals on land for which they held the right of use. In the past, most of this land was in rural areas, but has now become incorporated into urban villages as Xiamen's built-up area has spread out from the original core. Renting a self-built house tended to be much cheaper than renting a commercial house. Commercial real estate was the primary housing source for both homeowners and tenants. Welfare-oriented housing allocation was abolished in 1999; and since then, houses have no longer been provided to employees in state-owned organizations. However, public housing still ranked as the second source for residents.

4.2. Driving Factors of Homeownership

From the results concerning the respondents' characteristics, we found possible associations between home ownership and a household's demographic information, but the nature and direction of possible causal relationships remains unknown. The SEM method was applied; it hypothesized that education, income, occupation, occupational seniority, family size, and hukou status were factors

that influenced home ownership. The results showed that occupational seniority and family size are loosely related to home ownership. After occupational seniority and the hukou system were eliminated from the model, the alternative indices performed better. The goodness-of-fit index was 0.95; the standardized root mean square residual (SRMR) was 0.036, smaller than 0.05; the root mean square error of approximation (RMSEA) was 0.031, also smaller than 0.05. The normed fit index (NFI) and the comparative fit index (CFI) were 0.93 and 0.98, respectively; both were larger than 0.90. SEM results are illustrated in Figure 4 and Table 2.

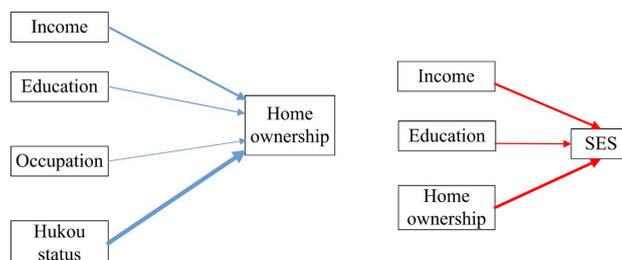


Figure 4. Structural equation model (SEM) model. Line width is proportional to effect. Blue lines represent the relationship between home ownership and its influencing factors. Red lines represent the relationship between SES and its influencing factors.

Table 2. Standardized regression weight for the SEM.

Variable	Effects on Home Ownership				Effects on SES		
	Education	Occupation	Income	Hukou Status	Income	Home Ownership	Education
Standardized regression weight	0.029	0.016	0.079	0.432	0.166	0.193	0.078

The variable with the largest effect on home ownership was hukou status, with a total effect of 0.432. It was followed by income, education, and occupation, with total effects of 0.079, 0.029, and 0.016, respectively. Hukou status has an important influence on home ownership, and there are significant differences between local people and migrant people in terms of education, occupation, and income. Many migrant workers maintain close ties with their places of origin, which may affect their housing choices in the locality [24]. Hukou status still shows the strongest influence among the tested variables on housing stratification. Home ownership is characterized by path dependence, the idea that an initial advantage could influence the course of history [49]. Path dependence could lead to significant inertia in an existing housing system that has to respond to policy transition. To a large degree, China's high rates of home ownership is a reform byproduct. When work units sold welfare houses to their employees in the 1990s, most people became home owners. This is an important factor of inequality among state-owned organization employees, privately owned company employees and the newcomer group. Our survey showed that 81.0% of respondents who worked in state-owned organizations owned houses, and only 53.3% of respondents who worked in other organization owned houses. In an excessively privatized market, it is difficult to reduce the housing ownership rate, even though inequality is expanding. In contrast to what we had presumed, family size was not significant in the model. This result was not consistent with a previous study which showed that that small family size had positive effects on home ownership [34]. Due to the national family planning policy, the nuclear family, in which two parents lived with an unmarried child, was the dominant family type in China. Occupational seniority could be reflected by income and occupation, so the model did not consider that factor.

The SEM results showed that market mechanisms and institutional forces have remained important in structuring the mode of home ownership for a long time, as the welfare-oriented housing allocation was abolished in 1999. Although efforts have been made over the intervening decades

to solve the housing problem, there are still failures to provide adequate and decent houses to all socio-economic classes. Hukou and occupation still play an important role in the housing market. Individual characteristics, such as income and education, were not as important as institutional factors in home ownership. A local family with high income and education levels, whose members worked in a publicly owned organization, was the most likely group to own a house.

4.3. Home Ownership Inequality in Various Groups

Logistic regression was used to quantitatively analyze home ownership stratification. A maximum likelihood estimator was used to fit the model. OR values of each variable in the logistical regression model were given in Table 3. At the $\alpha = 0.05$ level, income, education, family size, occupation, and hukou status were significant. The regression model verified that there was a large inequality in housing conditions among the various social groups.

Higher income increased the ORs of home ownership, with high-income and middle-income families having an OR of ownership that was 3.655 and 1.631 times higher, respectively, than that of low-income families (Table 3). Further analyses showed that high- and middle-income families also have a greater opportunity to access public housing. Some 30.9% of households whose family income was between 10,000 and 20,000 RMB per month, lived in public housing, while fewer than 20% of households of low-income families had a public house.

Table 3. Logistic regression analysis of home ownership ^a.

Variable	Categories	<i>b</i>	Standard Error	Wald ^b	<i>p</i> -Value	Odds Ratio (OR)
Intercept		−1.832	0.340	29.066	0.000	
Income (<i>x</i> ₁)	High income <i>x</i> ₁₁	1.296	0.354	13.443	0.000	3.655
	Middle income <i>x</i> ₁₂	0.489	0.230	4.508	0.034	1.631
	Low income	0 ^c				
Education (<i>x</i> ₂)	16-year <i>x</i> ₂₁	0.838	0.342	6.010	0.014	2.311
	12-year <i>x</i> ₂₂	0.680	0.326	4.347	0.037	1.974
	9 year <i>x</i> ₂₃	0.191	0.341	0.313	0.076	1.211
	6-year	0 ^c				
Occupation (<i>x</i> ₃)	Publicly owned organization <i>x</i> ₃₁	0.985	0.228	18.642	0.000	2.679
	privately owned firms	0 ^c				
Hukou (<i>x</i> ₄)	Local population <i>x</i> ₄	2.002	0.185	116.477	0.000	7.402
	Migrant population	0 ^c				

^a The reference category is households without home ownership; ^b The Wald test is used to test a single hypothesis on multiple parameters, as well as to test jointly multiple hypotheses on single/multiple parameters, which is supposed to follow asymptotically a normal distribution with a covariance matrix; ^c The parameter is set to 0 because it is redundant.

Similar to family income, a higher education level increased the OR of home ownership. Logistic regression showed that the ORs of home ownership after a 9-year education, a 12-year education, and a 16-year education were 1.211, 1.974 and 2.311 times higher, respectively, than after a 6-year education. Some 47.6% of respondents with only 6 years of education owned houses, compared with 60.1% of respondents with a 9-year education and 73.2% of respondents with a 10-year education. The biggest differences, however, were apparent in commercial home ownership rather than in public housing. The percentage of people who owned commercial houses increased with increasing education. Only 16.3% of respondents with 6 years of education owned a commercial house, compared with 32.5% for those with 9 years of education and 46.4% for those with more than 12 years of education. In contrast, no matter how many years of education they received, about 20% of respondents in each group purchased public houses.

Respondents who worked in a public organization were significantly more likely to own a home than those in other groups. The percentage of respondents who owned their homes was 93.9%, 81.1%, and 78.8% for those in government, public institutions, and state-owned enterprises,

respectively. Publicly owned organizations no longer have the right to allocate public houses to their employees. Previously, however, public housing remained largely the prerogative of the publicly owned organizations, during the welfare housing allocation period and the sale of subsidized public housing [50]. This prerogative continued to influence home ownership. People in publicly owned organizations, especially those who work for the government, have more opportunity to access public housing than do the other groups. The percentage of people owning public housing was 41.94%, 46.58%, and 38.46% for those in government, public institutions, and state-owned enterprises, respectively, but the number was less than 30% for other groups. Local people who worked in publicly owned organizations were able to purchase public houses at discounted prices and consequently gained substantial invisible earnings due to the significant capital appreciation of their property. The decision to benefit those with connections to the government and higher socio-economic status during the housing reform process evidently increased housing stratification.

Local people were 6.4 times more likely to own a house than members of the migrant population. Local people tended to live in the traditional downtown area and in newly developed built-up areas with good infrastructure and facilities. The migrant population showed a positive spatial autocorrelation that was related to land prices [51]. The migrant population tended to live in high-density, low-cost urban villages that contained mixed industrial and residential areas and that were served by relatively poor infrastructure. About two-thirds of the migrant population rented houses to live in, while only 18.7% of local people rented houses. Of local people, 34.3% purchased public houses and 42.0% purchased commercial houses. While some migrants purchased houses in the real estate market, most such houses were not affordable to migrant people due to rising prices. They therefore preferred to live in low-rent urban villages adjacent to their workplaces (often factories). As a result, a new type of housing poverty has been emerging among migrant households [35].

By substituting the correlation coefficients from Table 3 into Equation (1), we obtained the following probability model for home ownership.

$$p = \frac{\exp(-1.832 + 1.296x_{11} + 0.489x_{12} + 0.383x_{21} + 0.680x_{22} + 0.191x_{23} + 0.985x_{31} + 2.002x_4)}{1 + \exp(-1.832 + 1.296x_{11} + 0.489x_{12} + 0.383x_{21} + 0.680x_{22} + 0.191x_{23} + 0.985x_{31} + 2.002x_4)}$$

The AUC value ranged from 0.613 to 0.741 with a 95% confidence interval and indicated a good assessment.

4.4. Socio-Economic Status (SES) and Home Ownership

Income, home ownership, and education have a positive influence on SES, with total effects of 0.166, 0.193, and 0.078, respectively. In addition to income and education, our results indicate that home ownership also has a causal relationship with SES. The OR of a person with high SES owning a house was 12.3 times higher than one with a very low SES. Some 30.9% of respondents who did not own their homes declared low or very low SES, whereas less than 10% of respondents who did own their homes declared low or very low SES (Figure 5). Home ownership play a significant role in SES, and housing reform has tended to increase social stratification rather than to reduce it.

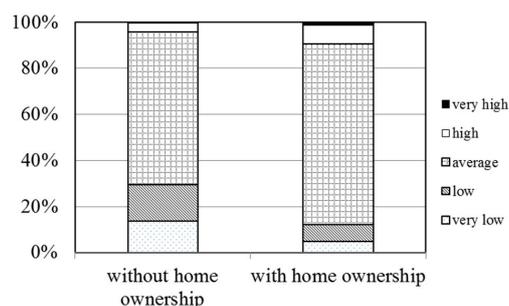


Figure 5. The relation between socio-economic status (SES) and home ownership.

5. Conclusions

This paper reports the results of a spatial sampling survey reporting on the various resources available for residents to obtain housing. Commercial housing is the primary housing resource, but public housing still accounts for 33.4% of all houses. A SEM further verified the causal relationship, allowing the interactions among various factors to be better understood. Hukou status has the strongest effect on home ownership; followed by income and education, while occupation is less important. The effects of institutional factors are larger than the sum of all other factors. In addition to income and education, home ownership is also causally related to SES. We used logistic regression to develop a probability model for home ownership. Housing stratification was prominent and increased by the interaction of institutional transitions and socio-economic differences. Since 1999, housing reform in Xiamen has tended to increase social inequality, rather than reduce it.

Our research verified that home ownership greatly influences SES, which can further deepen social stratification, disrupt social coherence, and give rise to other social problems. Previous research verified that housing affordability was a driver of migration into less advantaged places or the restructuring of cities into separated areas with distinctive social-economic features [52]. Migrants experience difficulty gaining access to home ownership, resulting in poor access to public services. There is still significant bias against migrants, which prevents their children from attending public schools. Such a trend makes cities become less attractive for migrants, who could be an important labor source. If more migrants avoid developed cities, a serious labor shortage could be unavoidable there, especially as China anticipates the loss of its demographic dividend in the near future. The economic system could lose its vitality. In contrast, according to United Nations Environment Programme (UNEP), sustainable housing could generate new economic opportunities for residents through urban integration and planning [53].

The results reported here have several implications for sustainable housing policy. As stated by Chan and Buckingham [54], hukou status creates a system of cities with invisible walls, and is considered as the most crucial foundation of China's social and spatial stratification. Local governments have embarked on a campaign to build social housing with low rents or low prices for urban residents in recent years, under the guidance of the 2010 program, *Promoting the Health Development for the Real Estate Market* [55]. The supply of social houses, however, lagged behind the rapid development of housing markets. The social houses were built for urban residents with household registration certificates, but only 56% of the units called for by the Economic and Social Development Plan were actually constructed. This figure lagged far behind other plan indicators [56,57]. Only a small percentage of urban residents (less than 400 households in Xiamen) successfully apply for these houses each year [58]. The migrant population is not currently allowed to apply for social housing, and future housing policy should attempt to provide affordable houses for all socio-economically disadvantaged families, especially for the migrant population. There were significant differences between local people and migrant people in terms of education, occupation, and income. Housing policy in isolation will not overcome these problems [11]. As the SES of homeowners was significantly higher than that of non-homeowners, policies should pay more attention to the welfare of renters, facilitating their access to education, employment, and a reasonable income and integrating the migration process into urban planning.

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References

- Vallance, S.; Perkins, H.; Dixon, J. What is social sustainability? A clarification of concepts. *Geoforum* **2011**, *42*, 342–348. [[CrossRef](#)]
- Reeves, P. An Introduction to Social Housing. Elsevier Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP 30 Corporate Drive, Burlington, MA 01803, 2005. Available online: http://www.untag-smd.ac.id/files/Perpustakaan_Digital_1/HOUSING%20An%20Introduction%20to%20Social%20Housing.pdf (accessed on 10 May 2016).
- World Commission on Environment and Development (WCED). *Our Common Future*; Oxford University Press: Oxford, UK; New York, NY, USA, 1987.
- Bramley, G.; Power, S. Urban form and social sustainability: The role of density and housing type. *Environ. Plan. B* **2009**, *36*, 30–48. [[CrossRef](#)]
- Suopajarvi, L.; Poelzer, G.A.; Ejdemo, T.; Klyuchnikova, E.; Korchak, E.; Nygaard, V. Social sustainability in northern mining communities: A study of the European North and Northwest Russia. *Resour. Policy* **2016**, *47*, 61–68. [[CrossRef](#)]
- Missimer, M.; Rovert, K.; Broman, G. A strategic approach to social sustainability—Part 1: Exploring the social system. *J. Clean. Prod.* **2016**. [[CrossRef](#)]
- Sullivan, E.; Ward, P. Sustainable housing applications and policies for low-income self-build and housing rehab. *Habitat Int.* **2012**, *36*, 321–323. [[CrossRef](#)]
- Chiu, R. Social equity in housing in the Hong Kong special administrative region: A social sustainability perspective. *Sustain. Dev.* **2002**, *10*, 155–162. [[CrossRef](#)]
- Mora-Sanguinetti, J.; Rubio, M. Recent reforms in Spanish housing markets: An evaluation using a DSGE model. *Econ. Model.* **2014**, *44*, S42–S49. [[CrossRef](#)]
- Nuuter, T.; Lill, I.; Tupenaite, L. Comparison of housing market sustainability in European countries based on multiple criteria assessment. *Land Use Policy* **2015**, *42*, 642–651. [[CrossRef](#)]
- Choguill, C.L. The search for policies to support sustainable housing. *Habitat Int.* **2007**, *31*, 143–149. [[CrossRef](#)]
- Wong, T.C.; Goldbulm, C. Social housing in France: A permanent and multifaceted challenge for public policies. *Land Use Policy* **2016**, *54*, 95–102. [[CrossRef](#)]
- Radzimski, A. Changing policy responses to shrinkage: The case of dealing with housing vacancies in Eastern Germany. *Cities* **2016**, *50*, 197–205. [[CrossRef](#)]
- Quan, Z.X. Institutional transformation and marketisation: The changing patterns of housing investment in urban China. *Habitat Int.* **2007**, *30*, 327–341. [[CrossRef](#)]
- Zou, G.L.; Chau, W.K. Determinants and Sustainability of House Prices: The Case of Shanghai, China. *Sustainability* **2015**, *7*, 4524–4548. [[CrossRef](#)]
- Zhao, W. Economic inequality, status perceptions, and subjective well-being in China's transitional economy. *Res. Soc. Stratif. Mobil.* **2012**, *30*, 433–450. [[CrossRef](#)]
- Chen, H.; Ganesan, S.; Jia, S. Environmental challenges of post-reform housing development in Beijing. *Habitat Int.* **2005**, *29*, 571–589. [[CrossRef](#)]
- Wu, T.; Yu, Y.; Wang, B. Water resources availability and the growth of housing prices in China. *Resour. Conserv. Recycl.* **2016**. [[CrossRef](#)]
- Gao, L.; Cui, S.; Yang, D.; Tang, L.; Vause, J.; Xiao, L.; Li, X.; Shi, L. Sustainability and Chinese urban settlements: Extending the metabolism model of emergy evaluation. *Sustainability* **2016**, *8*, 459. [[CrossRef](#)]
- Zhao, J.; Xiao, L.; Tang, L.; Shao, G. Effect of spatial form on urban commute for major cities in China. *Int. J. Sustain. Dev. World* **2014**, *21*, 361–368. [[CrossRef](#)]
- Palm, M.; Gregor, B.; Wang, H.; McMullen, B.S. The trade-offs between population density and households? Transportation-housing costs. *Transp. Policy* **2014**, *36*, 160–172. [[CrossRef](#)]
- Wang, D.; Chai, Y. The job—Housing relationship and commuting in Beijing, China: The legacy of Danwei. *J. Transp. Geogr.* **2009**, *17*, 30–38. [[CrossRef](#)]
- Fu, Q.; Zhu, Y.; Ren, Q. The downside of marketization: A multilevel analysis of housing tenure and types in reform-era urban China. *Soc. Sci. Res.* **2015**, *45*, 126–140. [[CrossRef](#)] [[PubMed](#)]
- Tao, L.; Hui, E.C.M.; Wong, F.K.W.; Chen, T. Housing choices of migrant workers in China: Beyond the Hukou perspective. *Habitat Int.* **2015**, *49*, 474–483. [[CrossRef](#)]

25. Chen, G. Housing the urban poor in post-reform China: Some empirical evidence from the city of Nanjing. *Cities* **2012**, *29*, 252–263. [[CrossRef](#)]
26. Li, H.; Shen, Q. Supporting the decision-making process for sustainable housing. *Constr. Manag. Econ.* **2002**, *20*, 387–390. [[CrossRef](#)]
27. Yi, C.; Huang, Y. Housing consumption and housing inequality in Chinese cities during the first decade of the twenty-first century. *Hous. Stud.* **2014**, *29*, 291–311. [[CrossRef](#)]
28. Huang, Z.; Du, X.; Yu, X. Home ownership and residential satisfaction: Evidence from Hangzhou, China. *Habitat Int.* **2015**, *49*, 74–83. [[CrossRef](#)]
29. Bian, Y.; Liu, Y. Social stratification, homeownership, and quality of living: An analysis of China's fifth census. *J. Sociol. Res.* **2005**, *117*, 739–758.
30. Huang, Y.; Li, S. *Housing Inequality in Chinese Cities*; Routledge: New York, NY, USA, 2014.
31. Munch, J.R.; Rosholm, M.; Svarer, M. Home ownership, job duration, and wages. *J. Urban Econ.* **2008**, *63*, 130–145. [[CrossRef](#)]
32. Hendershott, P.; Ong, R.; Wood, G.; Flatau, P. Marital history and home ownership: Evidence from Australia. *J. Hous. Econ.* **2009**, *18*, 13–24. [[CrossRef](#)]
33. Angelini, V.; LaFerrere, A.; Weber, G. Home ownership in Europe: How did it happen? *Adv. Life Course Res.* **2013**, *18*, 83–90. [[CrossRef](#)] [[PubMed](#)]
34. Yi, C.; Lee, S. An empirical analysis of the characteristics of residential location choice in the rapidly changing Korean housing market. *Cities* **2014**, *39*, 156–163. [[CrossRef](#)]
35. Sato, H. Housing inequality and housing poverty in urban China in the late 1990s. *China Econ. Rev.* **2006**, *17*, 37–50. [[CrossRef](#)]
36. Huang, Y. Renters' housing behaviour in transitional urban China. *Hous. Stud.* **2003**, *18*, 103–126. [[CrossRef](#)]
37. Huang, Y.; Guo, F.; Tang, Y. Hukou status and social exclusion of rural-urban migrants in transitional China. *J. Asian Public Policy* **2010**, *3*, 172–185. [[CrossRef](#)]
38. Huang, Y.; Jiang, L. Housing inequality in transitional Beijing. *Int. J. Urban Reg.* **2009**, *33*, 936–956. [[CrossRef](#)]
39. He, S. A Review of "Housing inequality in Chinese cities". *Int. J. Hous. Policy* **2015**, *15*, 97–100. [[CrossRef](#)]
40. Duncan, O.D. A Socio-economic Index for all Occupations. In *Occupations and Social Status*; Reiss, J., Jr., Ed.; Free Press of Glencoe: New York, NY, USA, 1961; pp. 109–138.
41. Fujishiro, K.; Xu, J.; Gong, F. What does "occupation" represent as an indicator of socio-economic status? Exploring occupational prestige and health. *Soc. Sci. Med.* **2010**, *71*, 2100–2107. [[CrossRef](#)] [[PubMed](#)]
42. Tang, L.; Zhao, Y.; Yin, K.; Zhao, J. Xiamen. *Cities* **2013**, *31*, 615–624. [[CrossRef](#)]
43. Wang, J.F.; Jiang, C.S.; Hu, M.G.; Cao, Z.D.; Guo, Y.S.; Li, L.F.; Liu, T.J.; Meng, B. Design-based spatial sampling: Theory and implementation. *Environ. Model. Softw.* **2012**, *40*, 280–288. [[CrossRef](#)]
44. Wang, J.F.; Haining, R.; Liu, T.J.; Li, L.F.; Jiang, C.S. Sandwich spatial estimation for multi-unit reporting on a stratified heterogeneous surface. *Environ. Plan. A* **2013**, *45*, 2515–2534. [[CrossRef](#)]
45. Sandwich Spatial Sampling and Inference. Available online: <http://www.sssampling.org/> (accessed on 1 September 2016).
46. Huang, S.; Lo, S.; Lin, Y. Application of a fuzzy cognitive map based on a structural equation model for the identification of limitations to the development of wind power. *Energy Policy* **2013**, *63*, 851–861. [[CrossRef](#)]
47. Arbuckle, J.L. *Amos 16.0 User's Guide*; SPSS, Inc.: Chicago, IL, USA, 1995.
48. Wang, Y.; Song, C.; Lin, Q.; Li, J. Occurrence probability assessment of earthquake-triggered landslides with Newmark displacement values and logistic regression: The Wenchuan earthquake, China. *Geomorphology* **2016**, *258*, 108–109. [[CrossRef](#)]
49. Lin, Q.; Kalantari, M. A path dependence perspective on the Chinese cadastral system. *Land Use Policy* **2015**, *45*, 8–17. [[CrossRef](#)]
50. Wang, D.; Li, S. Socio-economic differentials and stated housing preferences in Guangzhou, China. *Habitat Int.* **2006**, *30*, 305–326. [[CrossRef](#)]
51. Xiao, L.; Li, X.; Zhang, G. Social differentiation empirical study and policy suggestion for permanent population. *Prog. Geogr.* **2012**, *31*, 183–190. (In Chinese)
52. Baker, E.; Bentley, R.; Lester, L.; Beer, A. Housing affordability and residential mobility as drivers of locational inequality. *Appl. Geogr.* **2016**, *72*, 65–75. [[CrossRef](#)]
53. United Nations Environment Program (UNEP). Sustainable Social Housing Initiative. Available online: http://www.unep.org/SustainableSocialHousing/why_sushi/why_buildings.asp (accessed on 19 July 2016).

54. Chan, K.W.; Buckingham, W. Is China Abolishing the Hukou System? *China Q.* **2008**, *195*, 582–606.
55. General Office of the State Council. Promoting the Health Development for the Real Estate Market. Available online: http://www.gov.cn/zwgk/2010-01/10/content_1507058.htm (accessed on 1 May 2016).
56. Tan, L.; Lou, C. Research on the central—Local government’s relations in the policy process of social housing: Analyzing and application of policy network theory. *J. Public Manag.* **2012**, *9*, 52–63. (In Chinese)
57. Ifeng News. The Century Dream. Available online: <http://news.ifeng.com/mainland/special/zgsbjwzqh/> (accessed on 12 December 2015).
58. Xiamen Construction Bureau. The Results of Social Housing Application. Available online: http://www.xmjs.gov.cn/bzzfw/gsxx/201511/t20151110_120612.htm (accessed on 23 December 2015).



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