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Structural evaluation of institutional bias in China's urban housing: the case of Guangzhou

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Abstract. Institutional bias is an important topic in social justice and the presence of institutional bias is widely recognized in China's urban housing sector. This paper proposes a new framework for measuring and assessing institutional bias in China's urban housing system based on structural equation modeling and the Pratt index of relative importance for linear regression. The proposed framework analyzes the structural pathways through which nonmarket institutional forces affect housing, and provides quantitative measures to evaluate both the direct and the indirect effects of biased institutions on housing outcomes. A case study of Guangzhou is presented to demonstrate the proposed ideas and methods using first-hand household survey data collected in 2009. The results of the case study show the dominance of institutional effects over market effects on housing outcomes through direct and indirect pathways. The results also show that, although institutional forces affect most subjective and objective measures of housing outcomes, they induce the largest effects on homeownership attainment and physical housing conditions. This suggests that, at this stage, property ownership and material housing well-being are two potential central areas of China's housing justice.

Keywords: institutional bias, social justice, urban housing, China

1 Introduction

One side effect of China's market-oriented housing reform is the rise of housing differentiation. In the past three decades the majority of China's urban population has experienced substantial improvement in housing conditions and living standards. But groups such as rural migrants, laid-off workers, and other members of the urban underclass have been marginalized in terms of housing access and housing well-being (Li and Wu, 2008; Logan et al, 1999; Wang, 2000). The primary reason that China's housing differentiation is a social justice issue resides in the fact that much of the housing inequality has been prescribed by unjust institutions; for example, those related to the hukou family registration (Chan, 1994; Wu and Treiman, 2004), the work unit system (Bourassa and Zhao, 2003; Huang and Clark, 2002), and the political hierarchy (Li, 2003; Logan et al, 1999). The practice of these institutions creates a systemic bias that persists through China's market transition, as institutional discriminants often translate into market differentials through multiple pathways (Bian and Logan, 1996; Li and Yi, 2007).

Although institutional bias in China's housing system is widely recognized (Lee, 2009; Ma, 2007), few studies have developed systematic strategies to thoroughly evaluate this bias. In general, past research has described the coexistence of market and nonmarket institutional forces in China's urban housing system (Huang and Clark, 2002; Li and Huang, 2006; Logan et al, 2009), but has paid little attention to the fact that the bias created by nonmarket institutions is at the root of most market-related factors. For example, a person's hukou status significantly constrains his or her access to education, employment, and other benefits, which subsequently affects his or her income and options on the housing market (Chan and Zhang, 1999; Gu et al, 2006). At this stage of China's housing reform, the old public housing system has already been replaced by a rapidly growing housing market. Institutional forces, though still playing an important role in China's socioeconomic system (Cartier, 2011; Huang, 2008), no longer possess the power of housing allocation, and their influence over housing distribution is mostly exerted through the housing market. It is important for empirical research to reflect this change and develop studies that not only address inequalities in housing outcomes, but also trace their roots at the institutional level.

This paper proposes an integrative framework for analyzing institutional bias—that is, the differentiation caused by nonmarket institutional forces—in China's urban housing system based on structural equation modeling (SEM) (Kline, 2011) and the Pratt index of relative importance for linear regression (Pratt, 1987; Thomas et al, 1998). The main purpose is to integrate multiple housing processes—including direct processes that have been investigated by past studies and indirect relationships that are difficult to capture using conventional methods—into a holistic analytical whole. Such an integrative analysis is capable of revealing the structural pathways through which institutional forces affect housing. Furthermore, it offers quantified measures that can be used to evaluate and compare the extents of institutional impacts on different aspects of housing, based on which priorities can be identified for social policies. To demonstrate how the proposed framework works, I conducted a case study using first-hand household survey data collected from the city of Guangzhou in 2009. The results of the case study provide detailed quantitative evidence pertaining to the institutional bias in Guangzhou's housing system, which is the first of its kind in the related literature.

The proposed framework can easily be generalized and applied beyond the urban housing sector, as similar institutional bias can be observed in most other sections of resource distribution in postreform urban China (Hong, 2010; Ma, 2002). Therefore, this study has broad empirical and methodological implications for China's contemporary urbanism in general. From this point on, this paper is organized as follows. First, relevant literature is reviewed to provide a conceptual foundation for the study. Next, the proposed analytical framework is described in detail. After that the Guangzhou study is presented and discussed. The final section summarizes and concludes the paper.

2 Institutional bias and China's housing (in)justice

Institutional bias refers to social institutions such as laws, customs, and other practices that "systematically reflect or produce group-based inequalities" in a society (Henry, 2010; Jones, 1997). Generally speaking, justice can be understood as a perceived order of reality that reflects the perceiving agent's definition of good (Barry, 1989). As the conception of justice is both a social and a perceptual process (Barry, 1989), social and political institutions are always biased in one way or another due to differences in individual perceptions. But the idea of institutional bias underlines the prescribed nature of certain inequalities (eg, those based on race, gender, religion, and sexual orientation), and stresses the fact that these inequalities are not simply the collective results of individual biases (Henry, 2010).

2.1 Institutional bias, social justice, and the importance of empirical studies

Institutional bias is a frequently discussed topic in social justice literature. In traditional liberal thought, social justice can be defined as a social and/or political order that respects the concept of good for all members of a society (Miller, 1999). A neutral institution that does not favor any specific groups, therefore, is often considered an important precondition for social justice (Demarneffe, 1990). In some conceptions of justice, institutional neutrality can be judged by consequences of socioeconomic processes (Barry, 1989; Rawls, 1971).

These outcome-based views, however, are opposed by advocates of procedural justice, who argue that a neutral institution should be one that does not interfere with what are seen as legitimate procedures of the socioeconomic system: for example, activities in a free market (Nozick, 1974). Most modern social justice theories usually recognize the rationales of both consequential and procedural justice, but they also stress the importance of assurance measures (eg, welfare policies) and the need to take care of disadvantaged groups (Rawls, 1971; Roemer, 1996). For these theories, regulating socioeconomic activities and redressing the inequalities they produce are necessary responsibilities of government (Beckman, 2001), and, consequently, institutional neutrality should be reflected by the 'neutral aims' of social policies rather than by neutral consequence or procedures alone (Rawls, 1985; 1988). Overall, most liberal theorists believe that institutional bias can be evaluated against a common baseline of neutrality, although the definition and the boundaries of such a common baseline are in debate.

However, the plausibility of any neutral institutional baseline—whether defined by outcomes, procedures, or aims—has been questioned by other authors. Sandel (1998), for example, points out that liberal conceptions of neutrality often take the assumption that justice can be measured by certain common attributes and/or resources (eg, health, wealth, and property) required for good life, yet ignore the fact that the utilities of these attributes and/or resources are not equal among individuals. Similarly, Sen (2009) argues that the freedom to pursue a good life not only depends on the availability of resources, but is also subject to a person's ability to transform resources into functioning activities. As a result, it is meaningless and misleading to pretend that there is some baseline institutional neutrality capable of benefiting all people equally, even though most people in a given society share a number of common moral principles. On the contrary, bias and justice should be evaluated locally and comparatively: for example, by examining whether social policies improve or worsen the condition of the target population on the basis of integrated and people-oriented measures (Herrero et al, 2012; Sandel, 1998).

In summary, although the concept of institutional bias is clearly defined in the literature, there is no agreement about what constitutes a 'just' institution and how it should be implemented in a society. Such a lack of consensus often leads to the 'invisible' bias, as the mainstream public, controlled by the dominant groups' conceptions of good, tends to be indifferent towards problems that only victimize minority groups (Bonilla-Silva, 1997). In many cases, institutional bias is noticed only after negative consequences are exposed by disasters, scandals, or other dramatic events; and, even when this happens, people usually focus on the immediate aftermath of such events (eg, the worsened conditions of the poor after a natural disaster) rather than on the underlying problems in the socioeconomic system (eg, policies that have nurtured poverty and segregation) (Henkel et al, 2006). For these reasons, the identification and evaluation of institutional bias constitute an imperative responsibility for empirical research, because they are the first step towards revealing and understanding injustices. Given the theoretical debates on neutrality and the diverse definitions of justice in the literature, empirical knowledge is particularly important to social policies, as it offers the first-hand guidance based on which decision makers can prioritize policy goals and select practical measures.

2.2 Evaluating institutional bias in China's urban housing

Many authors have noted the difficulty of determining the causes of and responsibility for complex inequalities (Hoffman and Reed, 1982; McCrudden, 1982). For example, imagine a case study in which the average housing conditions of Black households are found to be worse than those of non-Black households. The study also shows that Black adults tend to have lower incomes than non-Blacks—a disparity that directly affects the housing options of both groups. The racial difference in housing may even disappear after income is controlled for (eg, by comparing Black and non-Black households at the same income levels). Would it be correct to conclude that racial bias is not responsible for the housing disparity in this fictional study? Furthermore, if race is indeed a factor, does it contribute more to the observed housing differentiation than to the income variable? To answer these questions, it is necessary to trace the roots of the housing inequality in an integrative and historical way. The racial bias resides in the fact that past discrimination has resulted in inequalities in educational attainment, employment opportunities, and income levels, which subsequently cause housing disadvantages against the Blacks (Bonilla-Silva, 1997; Feagin, 2000). To measure the impact of racial bias, it is necessary to examine all pathways of housing differentiation in which race is at the roots.

Such an integrative and historical view is particularly important for understanding China's urban housing system, which has been undergoing dramatic changes in the past three decades. China's prereform public housing system was modeled largely on the socialist redistributive hierarchy, the inequity of which has been well documented (Logan et al, 1999; Wang and Murie, 1999). Despite the progress of marketization, differentials in the old housing institutions have left remarkable legacy effects on the current housing system. Since housing is a durable good, it is not uncommon that a family is still living in housing units obtained before the housing marketization and will continue to do so in the near future. Furthermore, policies such as the subsidized public housing purchasing programs implemented in work units during the mid-1990s have resulted in an unequal redistribution of wealth across the hierarchy defined by the old housing institutions, which can affect China's housing market for generations (Li, 2007). In other words, strong direct relationships between institutional factors and housing outcomes can be observed for an extended period of time in urban China. On the other hand, although institutional forces still play a central role in China's urban economy in general and housing distribution in particular, the first decade of the 21st century has seen the initial establishment of a fledgling housing market in urban China. Compared with the institutionalized housing allocation in the prereform era, nonmarket institutions nowadays seldom control housing outcomes directly; more often than not they exert their influence indirectly through the housing market: for example, by affecting income, employment, and other market-related constraints of housing outcomes. This further complicates China's housing differentiation and makes institutional bias more difficult to evaluate because institutional forces can affect housing outcomes through multiple pathways.

In recent years, China's urban housing sector has become a hotbed of social discontent, as the ownership-oriented housing marketization and neoliberal urban policies continue to create tensions and confrontations between different contestants of urban space (He and Wu, 2009). Improving the condition of social justice in the urban housing sector, therefore, is not just a moral goal, but also a necessary step for the development of a harmonious society. Given the complexity of housing differentiation and importance of institutional influence in the postreform urban China, a sound and thorough evaluation of institutional bias is an indispensable first step for the pursuit of social justice. Specifically, the empirical evaluation should: (1) capture various direct and indirect pathways of institutional influences so that the underlying mechanisms of housing differentiation can be better understood; and (2) offer an integrated measure of institutional bias with which decision makers can assess and compare the severity of bias in different aspects of housing and thus prioritize policy goals. The main purpose of this study, therefore, is to develop a new analytical framework that can fulfill these two requirements.

3 Framework of analysis

The empirical framework in this study uses structural equation modeling (SEM) to analyze the structural pathways through which institutional forces affect housing, and introduces a measure to quantify institutional effects based on the Pratt index of relative importance for linear regression. The details of these methods are described in the rest of this section.

3.1 Structural equation modeling

Structural equation modeling (SEM) is a family of statistical methods devised to estimate multiple linear models simultaneously. An SEM model usually comprises a 'measurement part' and a 'structural part'. The measurement part is defined by factor analyses, wherein latent factors are measured or indicated by observed variables. The structural part consists of regression models built using the latent and/or observed variables, which can be specified such that independent variables in one regression are dependent variables in others. In SEM nomenclature, dependent variables are known as 'endogenous variables', and independent variables are called 'exogenous variables'. SEM methods are necessary because estimating multiple linear models separately leads to misleading results and incorrect inferences due to the repeated and isolated use of the same data (Kline, 2011). But the interpretation of a SEM model is similar to that of regression models, as the coefficients of exogenous variables correspond to the beta coefficients in a linear regression.

Figure 1 depicts a hypothetical SEM model in which squares represent observed variables and circles denote latent variables. An arrow from a circle to a square represents a factor loading, and arrows between circles indicate 'causal links', each of which corresponds to a regression term with the target node as the endogenous (dependent) variable. There are three latent variables (ie, circles) in figure 1. The institutional factor latent variable is measured by hukou and work unit, two observed variables recorded in the hypothetical dataset (the data types of these two variables do not affect the demonstration). Similarly, market factor

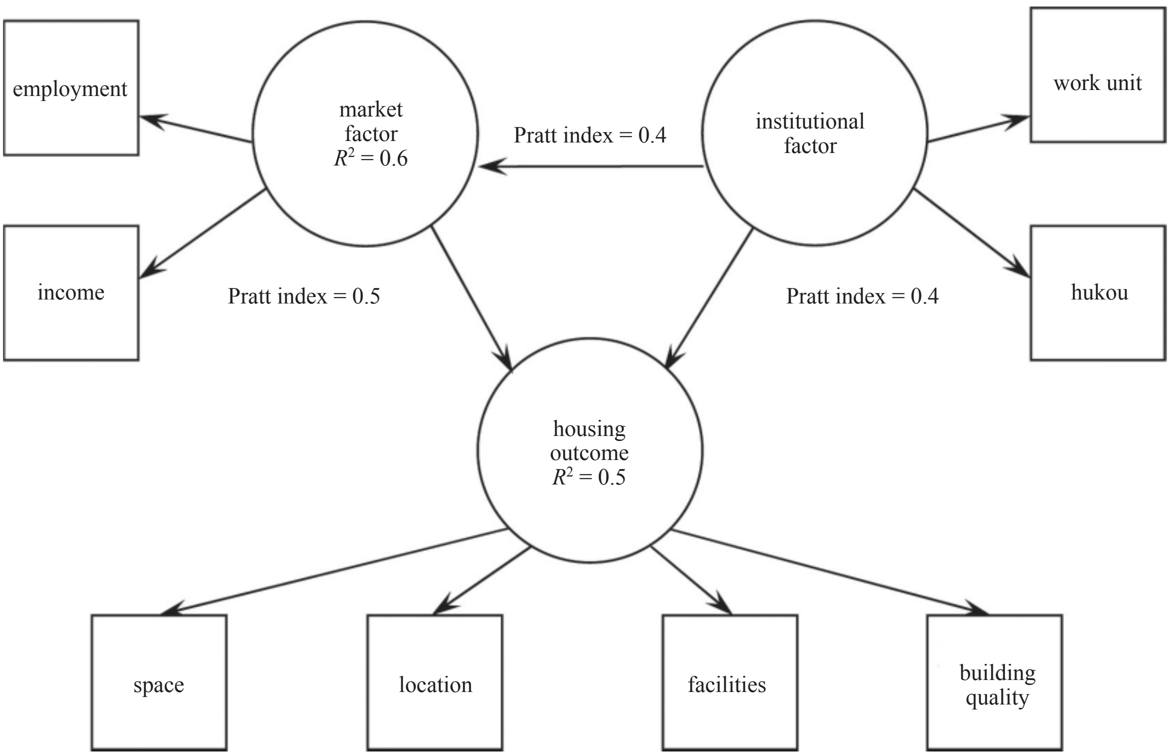

Figure 1. An example of SEM (structural equation modeling) models, where squares represent observed variables, circles indicate latent variables. Hypothetical values of the R^2 and Pratt index are listed to demonstrate the calculation of the proposed measures.

is measured by income and employment, whereas housing outcome is measured by space, facilities, location, and building quality. The structural part of the model can be rewritten as two regression equations:

$$\text{housing outcome} = \beta_1 \times \text{institutional factor} + \beta_2 \times \text{market factor}; \quad (1)$$

$$\text{market factor} = \beta_3 \times \text{institutional factor}. \quad (2)$$

3.2 The Pratt index of relative importance

The next issue is to quantify the effects of institutional factor and market factor on housing outcome. For convenience, let us consider the linear regression of y on n independent variables, $x_1, x_2, \ldots, x_n$:

$$y = \beta_0 + \beta_1 x_1 + \ldots + \beta_i x_i + \ldots + \beta_n x_n . \quad (3)$$

In conventional regression analyses, it is customary to treat the beta coefficients in equation (3) as the effects of independent variables on y. However, the meaning of the beta coefficient is based on the ideal situation of controlled unit effects: that is, indicating the change in y results from a unit change in the correspondent x if all other independent variables remain fixed. This imposes a serious problem when the interpretation of independent variables cannot be controlled and isolated in this way. For example, in the SEM models described above, it is unreasonable to assume that market factor in equation (1) would remain constant when institutional factor changes, because, according to equation (2), any changes in the institutional factor will elicit changes in the market factor.

In this paper a measure known as the Pratt index of relative importance (Pratt, 1987; Thomas et al, 1998) is adapted to indicate the effects of independent variables in a linear model. It is worth noting that the proportion of y's variation 'explained' by a linear model can be measured by the model's R^2. Consequently, an independent variable's effect on y can be measured by that variable's contribution to the R^2. The Pratt index (p_t) of relative importance, therefore, is defined as the proportionate contribution of an independent variable to the R^2, which can be written as

$$p_t = \frac{\beta_t r_t}{R^2} . \quad (4)$$

Here β_t is the beta coefficient for a target independent variable x_t, and r_t denotes the correlation coefficient between x_t and y. According to the geometric interpretation of the Pratt index (Thomas et al, 1998), it is possible to use estimated values for β_t and r_t in equation (4). Furthermore, although equation (4) was originally defined for multiple regressions of continuous y, it can be applied in generalized linear models with categorical dependent variables (eg, logistic regression) based on polychoric correlation and pseudo-R^2 measures (Thomas et al, 2008).

The division by R^2 in equation (4) normalizes the Pratt index value, and as a result the sum of the Pratt index values for all regressors in a linear model equals 1 (the additive property) (Thomas et al, 1998). However, in many cases it is useful to examine the contribution of a regressor to the total variation in y, which can be calculated by:

$$c_t = p_t R^2 = \beta_t r_t . \quad (5)$$

In this paper, c_t is known as the contribution index for the independent variable x_t, and a variable's contribution index with respect to a dependent housing outcome is used to indicate the variable's effect on the housing outcome.

3.3 Combining SEM and the contribution index

The Pratt index can easily be generalized to SEM settings with multiple linear equations using latent variables (Zumbo, 2007), but the contribution index c_t defined by equation (5) must be adjusted to reflect direct and indirect effects shaped through structural pathways. In equation (1), for example, it is intuitive that the effect of market factor can be divided into two parts: the part caused by its own variation, which represents the direct effect of market factor; and the part that can be attributed to institutional factor based on equation (2). The indirect effect of institutional factor mediated by market factor, therefore, can be derived by synthesizing the effect of market factor on housing outcome in equation (1) and the effect of institutional factor on market factor in equation (2).

For clarity, additional parentheses are used in the notation to help denote different regression equations. For example, $R^2(y)$ indicates the R^2 or pseudo-R^2 of the regression of y, and $c_t(y)$ represents the contribution of a target variable x_t to the total variation in y. Let $q_t(y)$ denote the indirect effect of x_t on y, so that we have

$$q_t(y) = \sum_{i=1}^{n} c_i(y) c_t(x_i) . \tag{6}$$

In equation (6) each intermediate variable x_i mediates a portion of the indirect effect of x_t on y, which can be calculated by multiplying the contribution index of x_i with respect to y, denoted by $c_i(y)$, and x_t's contribution to x_i, denoted by $c_t(x_i)$. For example, institutional factor's indirect effect on housing outcome, based on the hypothetical Pratt index and R^2 values in figure 1, is $(0.5 \times 0.5) \times (0.6 \times 0.4) = 0.06$. In other words, 6% of the variation in housing outcome can be attributed to indirect institutional influence.

The direct effect of a target variable x_t with respect to y, denoted by $d_t(y)$, can be represented by its contribution index value minus the indirect effects of other variables mediated by x_t:

$$d_t(y) = c_t(y)\left\{1 - \sum_{i=1}^{n} c_i(x_t)\right\} . \tag{7}$$

In the example described above, this means that the indirect effect of institutional factor mediated through market factor should be subtracted from market factor's own contribution to housing outcome. Using the hypothetical values in figure 1, this yields $(0.5 \times 0.5) - 0.06 = 0.19$.

Finally, instead of using equation (5), a target variable x_t's contribution index should be redefined in the SEM settings. This can easily be done by summing up the direct and indirect effects:

$$c_t(y) = d_t(y) + q_t(y) . \tag{8}$$

This represents the overall effect of x_t on y. In the example described by equations (1) and (2) and depicted in figure 1, the direct effect of institutional factor is $0.4 \times 0.5 = 0.2$ and its overall effect is $0.2 + 0.06 = 0.26$. Note that the direct effect of market factor on housing outcome in equation (1) is $0.5 \times 0.5 = 0.25$, which is greater than that of institutional factor (0.2). But after we adjust for both direct and indirect effects, institutional factor's effect is greater than that of market factor. Unlike the beta coefficients in conventional linear regression, which cannot be used to compare effect sizes in this setting, the proposed effect measures are quantitatively comparable and therefore can be used to assist decision making.

4 The case study of Guangzhou

Guangzhou is a megacity located in China's southern Pearl River Delta (figure 2) and the capital of the Guangdong province. An important political, economic, and cultural center for the region, the city of Guangzhou has been a frontier for China's economic reform and housing marketization, and therefore has offered an excellent observatory and case site for studies on various issues related to China's urbanism, with housing as a major focal point (eg, Li, 2000; 2003; Tian, 2008; Tian and Ma, 2009).

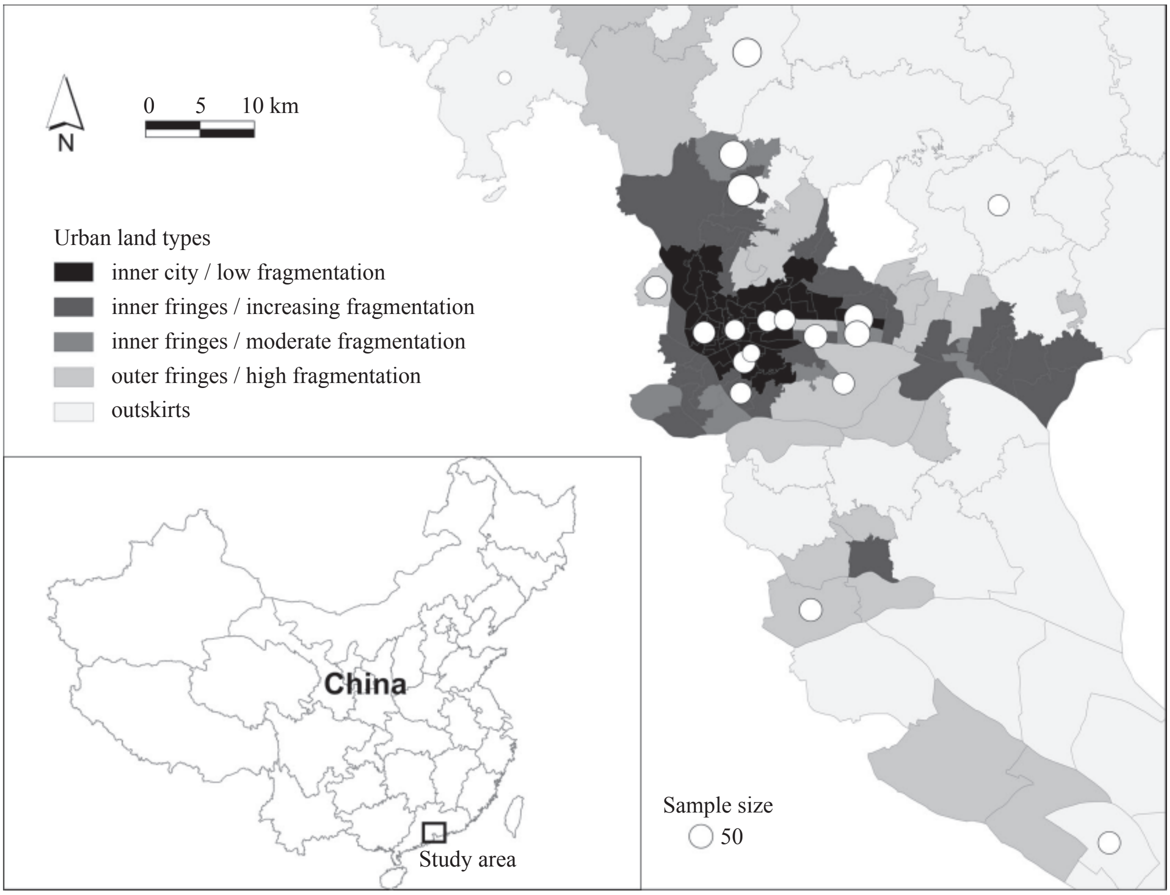

Figure 2. The 2009 survey of Guangzhou.

4.1 Data collection

The dataset used in the case study was collected in the summer of 2009 through a face-to-face questionnaire survey. At the time the survey was conducted, the entire municipality of Guangzhou consisted of ten districts and two satellite cities. The survey was conducted in all ten districts, which comprised 148 street/township subdistricts (Jie-Dao/Zhen) with a combined total of 1456 residents committees and 643 villagers committee areas. The survey selected 14 residents committees and 5 villagers committees based on a stratified multistage random sampling strategy designed to balance costs and representativeness. We began by evaluating Guangzhou's urban growth using land-cover maps in 2000 and 2008. The 2000 map was obtained from a third party (Liu et al, 2005), and the 2008 map was created from Landsat Thematic Mapper data using a simple two-class supervised classification procedure that only identifies open space and built-up areas. The ground truth points were obtained through human interpretation based on online high-resolution satellite images such as those provided by Google Earth. The main purpose of using land-cover maps to guide the sampling was to ensure that areas of different urban-growth types, including exclaves of built-up areas resulting from leapfrog urban development, were properly stratified and represented in a relatively small sample.

For each of the 148 street/township areas, we computed the average value of a sprawl index for both 2000 and 2008 (Burchfield et al, 2006). The sprawl index was a simple fragmentation indicator that calculated the percentage of open space (non-built-up pixels) in a 33×33 moving window for each built-up pixel. Based on the sprawl measure and the percentage of built-up areas, we classified the 148 street/township subdistricts into five categories: (1) inner-city areas with low fragmentation; (2) inner-city fringes with increasing fragmentation (ie, fragmentation in 2008 is greater than in 2000); (3) inner-city fringes with stable and moderate fragmentation; (4) outer-city fringe with high fragmentation; (5) outskirts with large open areas (figure 2). Here inner-city areas are defined as street/township subdistricts with high percentages of built-up areas (>99%) in both 2000 and 2008, and inner-city and outer-city fringes are subdistricts with relatively high percentage of built-up areas (>50%). Outskirts are subdistricts with relatively low percentages of built-up areas in 2008 (<50%). Residents/villagers committees were then randomly selected from the list of all such committees for each of these five categories using a proportionate to size sampling strategy.

Finally, for each of the 19 residents/villagers committees, 4% of the households were randomly selected from the full household lists obtained from the residents/villagers committee offices. We sought assistance from the committee offices to ensure access to the selected communities, many of which were gated. The initial response rate was decent, as after the first attempt, we interviewed approximately 68% of the households. When our first attempt to conduct the survey was unsuccessful, we made at least one additional attempt to interview the same household. If additional attempts were also unsuccessful, we selected a replacement among the nearby households. In total, 924 households completed the questionnaire survey. The survey sample was balanced among populations in the inner city and in different newly assimilated districts. The average age of the respondents was 40 years, and the average monthly household income was 5423 RMB yuan. Moreover, 27.8% of the respondents were rural migrants, ie, holding a non-Guangzhou rural hukou), and 48.5% of the respondents had full or partial ownership of their housing.

The information collected by the survey was classified into several categories, each of which was assigned a three-letter identifier for convenience. The following categories describe the respondents' socioeconomic backgrounds, which were used as explanatory variables in this case study:

- demographic characteristics (DEM) such as age, gender, marital status, household membership;
- institutional factors (INS), such as hukou status, Communist Party membership, and work unit affiliation;
- market-related factors (MAR), such as income, employment, and educational level (since education is a proxy of competitiveness on the labor market).

Furthermore, the survey generated twenty-five measures of housing and residential conditions, which include the following categories:

- environmental quality (ENV), including respondents' ratings of water quality, air quality, pollution from waste disposal and from other sources such as noise, and concerns over disease;
- residential quality (RES), including respondents' ratings of the neighborhood in terms of hygiene, community services, recreation, security, and greenness;
- location (LOC), including respondents' reported ease of access to work, school, and transportation; and
- physical housing conditions (PHC), including building quality, floor plan, and the facilities offered by the dwelling units.

In addition, the survey collected information about homeownership (OWN) and each housing unit's size (AHS). The definition of homeownership is the possession or expected possession of the official housing ownership certificate and land-use permit, whereas the size variable measures the usable floor space. Due to space limitations, it is not possible to describe every survey variable in detail. Readers can consult table 1 for variables included in the final results. Each of the categories described above corresponds to a latent variable (in bold text) in table 1, and the observed variables (ie, the survey variables) in that category are listed after the latent variable.

Table 1. Factor structure and loadings for the final measurement model.

Variable	Loading
Latent explanatory variables	
DEM—*demographic factor*	
Respondent's marital status (binary with 1 = married)	0.997***
Respondent's age (numeric)	0.917***
Number of children in the family (numeric)	0.917***
INS —*institutional factor*	
Whether the respondent holds a local hukou (binary with 1 = yes)	0.893***
Whether the respondent holds an urban hukou (binary with 1 = yes)	0.802***
Whether the respondent's employer is a state-affiliated (binary with 1 = yes)	0.730***
Whether the respondent is a member of Communist Party (binary with 1 = yes)	0.572***
MAR—*market factor*	
Whether the respondent is formally employed (binary with 1 = yes)	0.849***
Monthly household income (numeric)	0.841***
Respondent's education level (scale with 0 = illiterate and 5 = postgraduate)	0.639***
Latent housing variables	Loadings
ENV—*environment quality*	
Rating on water quality (Likert scale)	0.791***
Rating on air quality (Likert scale)	0.767***
Rating on pollution from waste disposal (Likert scale; value inverted)	0.739***
Rating on other concerns such as noise and disease (Likert scale; value inverted)	0.528***
RES—*residential quality*	
Rating on hygiene of community (Likert scale)	0.767***
Rating on community service (Likert scale)	0.713***
Rating on recreation (Likert scale)	0.703***
Rating on security (Likert scale)	0.702***
Rating on greenness of neighborhood (Likert scale)	0.617***
LOC—*convenience of location*	
Rating on accessibility to market places and shopping sites (Likert scale)	0.816***
Rating on ease of transportation (Likert scale)	0.806***
Rating on accessibility to schools (Likert scale)	0.717***
PHC—*physical housing conditions*	
Whether the house has bathroom (binary with 1 = yes)	0.708***
Building quality (scale 1 to 6)	0.630***
Whether the house has air conditioning (binary with 1 = yes)	0.618***
Whether the house has gas kitchen (binary with 1 = yes)	0.507***
Housing variables without latent structure	
OWN—home ownership (binary with 1 = own)	na
AHC—per capita housing space (numeric)	na

*** Two-tailed p-value < 0.001.

4.2 Data analyses

The SEM model in this analysis was constructed following the four-step approach proposed by Mulaik and Millsap (2000). In the first two steps, a confirmatory factor analysis (CFA) model was specified and refined based on outputs from exploratory factor analyses (EFA). The general rule was to designate large EFA loadings (>0.5) as free loadings (ie, freely estimated parameters) in the CFA and set small loadings to zero. The resulting factor structure is described in table 1. After the CFA model was specified, an initial structural model containing theoretically possible causal links was added and tested. For continuous endogenous variables, linear regression models were used. For binary endogenous variables, generalized linear models with the logit linking function (ie, logistic regressions) were specified. The structural model was refined repeatedly by dropping, adding, and/or revising causal links according to criteria such as modification indices (Kline, 2011) until a satisfactory model was obtained. The final model was estimated in the software package Mplus (Muthén and Muthén, 1998–2001) using the WLSMA estimator. A clustered complex design was used with residents/villagers committees as the clusters so that Mplus could properly handle error estimation and significance tests. After the final model had been estimated, the contribution index values for the institutional and market latent factors were calculated. For categorical variables such as homeownership (OWN), the polychoric correlation (Drasgow, 1986) measure and the pseudo-R^2 measure defined by McKelvey and Zavoina (1975) were used in the calculation.

4.3 Results

The results of the SEM model are reported in figure 3 and table 2, and the effects of the institutional and market factors are reported in table 3. Compared with conventional SEM reports, the parameters for the measurement part (ie, the factor loadings) are omitted in figure 3 to conserve space, as table 1 already gives a sufficient picture of the factor structure. The overall model fit is decent according to goodness-of-fit measures RMSEA (0.031), CFI (0.96), and TFI (0.95). Each row in table 2 records the results of the correspondent regression in the SEM model. For example, the first row of table 2 reports the regression of the latent

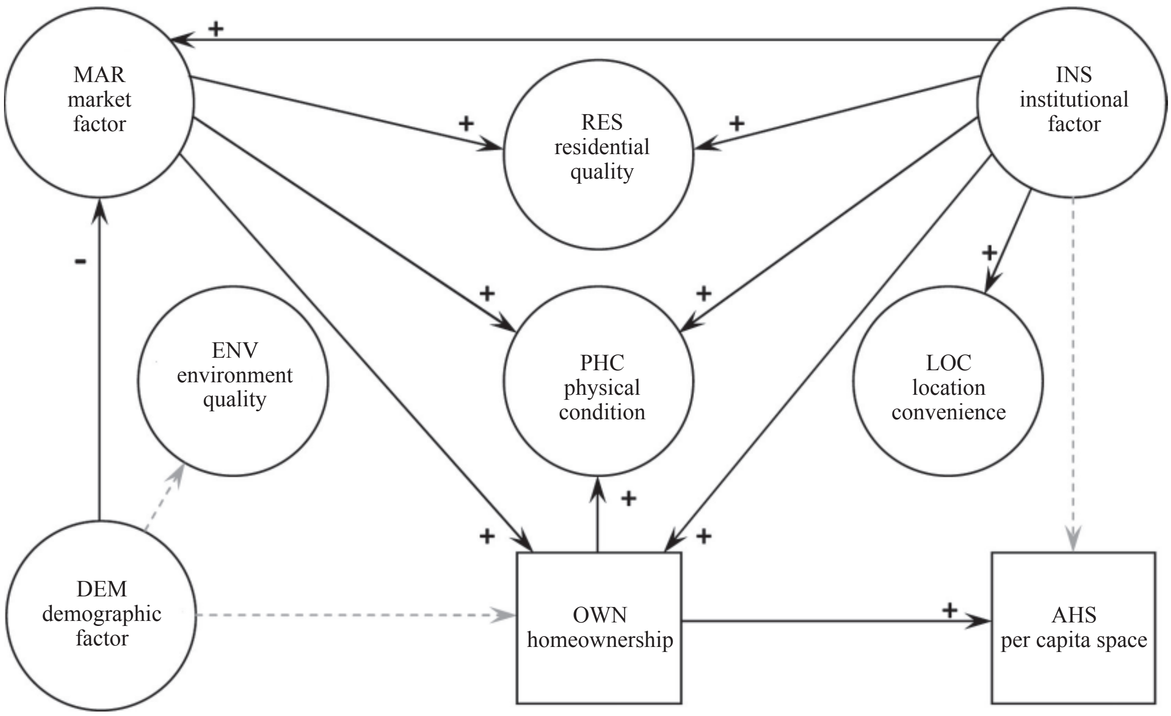

Figure 3. Path diagram of the final structural model, where gray dashed arrows indicate an insignificant link and the + and – denote positive and negative effects, respectively.

market factor (MAR) on the latent demographic (DEM) and institutional (INS) factors, which can be written as MAR = –0.573 × DEM + 0.547 × INS. The R^2 of this regression is 0.381. The R^2 values are reasonably high for homeownership (OWN) and for physical housing conditions (PHC), but much lower for the subjective ratings of living conditions (RES, LOC, and ENV) and housing space (AHS). This means that the institutional, market, and demographic factors defined in the factor model, explain a large proportion of differentiation in material housing well-being, but account for only a small fragment of variation in residential satisfaction.

Table 2. Results of the structural model and the effects of the institutional and market factors.

Equations	Beta coefficient	Estimated correlation	Pratt index
MAR—*market factor* (R^2 = 0.381)			
DEM—demographic factor	–0.573***	–0.358	0.538
INS—institutional factor	0.547***	0.322	0.462
OWN—*homeownership* (R^2 = 0.611)			
DEM—demographic factor	0.089	0.297	0.043
INS—institutional factor	0.682***	0.771	0.860
MAR—market factor	0.167**	0.355	0.097
PHC—*physical housing condition* (R^2 = 0.540)			
OWN—homeownership	0.217**	0.735	0.295
INS—institutional factor	0.356**	0.624	0.411
MAR—market factor	0.314***	0.505	0.294
RES—*residential quality* (R^2 = 0.138)			
INS—institutional factor	0.291***	0.341	0.719
MAR—market factor	0.155**	0.249	0.281
LOC—*convenience of location* (R^2 = 0.093)			
INS—institutional factor	0.305***	0.305	1.000
ENV—*environmental quality* (R^2 = 0.007)			
DEM—demographic factor	0.082	0.082	1.000
AHS—*per capita housing space* (R^2 = 0.158)			
INS—institutional factor	–0.146	0.139	–0.128
OWN—homeownership	0.369***	0.483	1.128

Note. Model fitness measures: RMSEA = 0.031 and 90% CI = (0.027, 0.034); CFI = 0.96; TFI = 0.95.
** Two-tailed p-value < 0.01; *** Two-tailed p-value < 0.001.

The multiple pathways depicted by the SEM model provide a full picture of how differentiations are shaped in different housing outcomes. The institutional factor's (INS) positive impacts on most of the housing outcomes generally agree with the existing understanding of China's urban housing system. One exception is the institutional factor's negative effect on per capita space (AHC), which is primarily due to the existence of large but low-quality housing stock owned by local hukou holders in the newly assimilated rural areas. Similarly, the latent market factor (MAR) positively affects residential quality (RES), physical housing conditions (PHC), and housing ownership (OWN). But the market factor does not significantly affect the convenience of location (LOC). Furthermore, it is shown that respondents living in dweller-owned homes generally enjoy better physical housing conditions (PHC) and per capita housing space (AHS); but homeowners do not necessarily give significant higher ratings on residential quality than non-homeowners. This suggests that the popular belief that homeownership improves residential satisfaction (Elsinga and Hoekstra, 2005) is not supported by the data.

Table 3 reports the effects of the institutional and market factors on multiple housing outcome variables. A major property of the results in table 3, as explained in previous sections, is that the sizes of the effects are quantitatively comparable. In general, the institutional factor has greater effects on all housing outcome variables than the market factor, which confirms the ongoing dominance of institutional forces in China's urban housing system. On the other hand, although the institutional and market factors are major determinants of homeownership attainment and physical housing conditions, their effects on residential quality (RES), convenience of location (LOC), and average housing space (AHS) are much smaller. This suggests that the institutional factor, as measured by hukou, state work unit affiliation, and political status, mainly creates biases in property ownership and material housing well-being. Furthermore, it is shown that the institutional factor's effect on homeownership is much larger than its effect on physical housing condition, as a sizable part of the differentiation in physical housing condition can be attributed to the market factor. In fact, according to table 2 and figure 3, much of the institutional factor's indirect effect on physical housing condition is mediated through the homeownership variable: that is, due to the difference in housing conditions between owners and nonowners. In other words, it is reasonable to argue that homeownership is currently the focal point of institutional bias and how to address tenure-based housing differentiation should be made a top priority of social policies.

Table 3. Effects of institutional and market factors as proportional contribution to variation in housing outcomes.

Housing outcome	Effect (%)		
	direct	indirect	overall
OWN—*homeownership*			
INS—institutional factor	52.5	1.0	53.5
MAR—market factor	4.9	0.0	4.9
PHC—*physical housing condition*			
INS—institutional factor	22.2	11.3	33.5
MAR—market factor	13.1	0.8	13.9
RES—*residential quality*			
INS—institutional factor	10.0	0.7	10.7
MAR—market factor	3.2	0.0	3.2
LOC—*convenience of location*			
INS—institutional factor	9.3	0.0	9.3
MAR—market factor	0.0	0.0	0.0
AHS—*per capita housing space*			
INS—institutional factor	0.0	9.6	9.6
MAR—market factor	0.0	0.9	0.9

5 Conclusion

This study uses SEM methods to capture the multiple pathways through which nonmarket institutional forces affect China's urban housing. A measure based on the Pratt index of relative importance for linear regression was also developed to represent the direct and indirect effects of relevant factors on housing outcomes in SEM settings, which can be used to compare the impacts of market and nonmarket institutional forces on housing and to evaluate the extent of institutional bias in housing outcomes. The application of the proposed framework in a case study of Guangzhou showed that institutional influences are much greater than market effects on most aspects of housing differentiation, while homeownership and physical housing conditions are two areas with the largest institutional effects. In particular, homeownership seems to be a focal point of institutional bias, as suggested by the dominant institutional effects on homeownership attainment and the fact that homeownership mediates a sizable portion of indirect effects on physical housing conditions.

Although the inequalities do not always lead to the perception of injustice (Lee, 2009), the systemic and biased nature of nonmarket institutional effects creates a major source of inequity that can translate into social discontent in a dramatic fashion. The results of this study, therefore, have important implications for social justice and housing in contemporary urban China. From the methodological perspective, the proposed analytical framework can also be extended and applied to other areas of resource distribution due to the omnipresence of nonmarket institutional forces in postreform urban China. From the empirical point of view, the results of the Guangzhou study suggest that reducing the bias in the material housing well-being and homeownership attainment are two priorities for housing policies in urban China. It is important to develop policies that seek to redress rather than approve the systemic bias in the status quo; for example, housing programs that downplay the role of hukou and encourage the participation of migrants. Furthermore, it is necessary to rethink the role of homeownership in China's housing marketization, as homeownership attainment is not only heavily biased, but also becomes a major differentiating factor of housing well-being. It is time to increase both the quantity and the quality of nonownership housing stocks and make them available to the broad urban society.

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