Housing inequality in urban China

Qiang Ren¹ and Rongqin Hu²

Abstract
Using data from a nationwide longitudinal survey, the current inequalities in housing conditions, property, ownership rate, market value, and dynamic changes of housing with difficulties were studied, and the affected factors from the characteristics of households and regional variations in urban China were explored. It was found that 77% of urban households owned their own houses, but 14% had housing difficulties in 2012. In addition, it was found that more than 67% of families owned one house, and more than 15% owned two or more. The median market value of current housing was 250,000 yuan, and the median market value per square meter was 2587 yuan. Finally, it was determined that household-level characteristics played important roles in housing inequality, and that regional variations significantly affected the likelihood of housing difficulties being present.

Keywords
China, housing inequality, household determinants, regional variations

Introduction
Housing is not only a necessity for survival, but also a primary ingredient for a happy and prosperous life. Living space and living conditions are thus two important indicators by which to measure the quality of a person’s life and degree of
social development. Studies have shown that living conditions can affect physical and mental health, family relationships, child development, life satisfaction and social identity (Baldassare, 1988; Chen and Feng, 2011; Gove et al., 1983; Song and Qi, 2011; Wang et al., 2011; Yin et al., 2010).

Housing and living conditions in China have changed substantially since the Housing Reform of 1988 (The State Council, 1988). In the past, China’s urban houses were mainly benefits provided by work units. Although the cost of living was low, living space and living conditions were allocated not according to actual demand based on family size and structure, but according to non-demand factors such as the social status, administrative level and political status of the head of household (or his/her spouse), and his/her relationship with superiors (Huang, 2003; Logan et al., 1999). Because there was no housing market before 1988, ways to improve living conditions were limited. In addition, due to the influence of the ideology of ‘production before consumption’, investment before 1978 in housing construction and supply was low.1 As a result, crowded housing was a common problem among urban families. After 1978, however, a surge of structural reforms spread rapidly across the country, and reform has continued throughout the housing system in China from 1988 to the present day. The abolition of the welfare-oriented distribution of public housing in 1998 marked the beginning of China’s market-oriented housing system. The ownership rate for national urban housing rose significantly thereafter, from 35.7% in 1995 (National Bureau of Statistics, 2001) to 89.3% in 2010 (National Bureau of Statistics, 2011).

The establishment of the housing market provided Chinese families with various housing options – such as buying new commercial or affordable housing, purchasing second-hand housing or privatizing a publicly owned house as a transitional step, collectively purchasing housing units, renting a private house, applying for low-rent housing, or self-constructing housing – and this has significantly improved Chinese housing conditions overall. Following the construction of low-rent housing, the living conditions of Chinese families have been further improved. According to official statistics, the urban per capita housing area has increased from 17.8 square meters in 1997 to 32.7 in 2011, and the rural per capita housing area from 22.5 to 36.2, respectively.2

Nonetheless, the living conditions of many Chinese families still need to be improved; the problem of crowded living conditions remains to be solved in full; and new housing problems associated with housing reform are emerging.

First, large-scale rural-to-urban and cross-regional population flows have put substantial pressure on cities and towns, and developed cities in particular. Second, housing marketization in an area is usually followed by a rapid rise in housing prices. For example, in 2005 the price of urban commercial housing was six times that in 1991, adjusted for CPI (Chen et al., 2011), and this is merely the national average level. In recent years, housing prices in Beijing, Shanghai, Guangzhou and other big cities have been increasing both more rapidly and to higher levels than household incomes. The high housing prices have placed enormous pressure on young Chinese prospective home-buyers, especially those migrating to big cities
Words such as ‘Woju’ and ‘Yizu’ vividly reflect the poor living conditions of the young generation. Third, housing assets account for 79% of total household wealth in urban China (Xie and Jin, 2015). The problem of housing inequality is severe. Housing inequality is one aspect of economic inequality, but it is different from income inequality: as a form of property that can appreciate, housing is valuable and it can be inherited by the next generation (Oliver and Shapiro, 1997). Against the background of housing marketization and privatization, the first generation of low-income groups was unable to purchase a single home, while high-income groups might have more than one house. The wealth gap between the two groups widened rapidly in the context of massive increases in real estate prices. In addition, the starting point for social mobility of the next generation could also be affected. Differentiation in housing conditions, property, and housing location is therefore manifested not only between social classes, but also between generations (Liu and Hu, 2010). This type of inequality is more difficult to change than income inequality.

In light of the housing problems in present-day China outlined above, this paper will first describe current housing conditions, property and ownership of housing, and the problem of housing prices in urban areas, and will then explore those factors that influenced housing inequality from among the characteristics of households and regional variations.

**Data, measures and analytic strategy**

The data used in this analysis are taken from the China Family Panel Studies (CFPS), a national multi-stage probability sample of Chinese families (see Acknowledgements). In the 2010 CFPS baseline survey, 14,960 households and all their inhabitants were interviewed (Xie and Lu, 2015). Five provinces — Liaoning, Hebei, Shanghai, Guandong and Gansu — were selected to be oversampled, for the purposes of regional comparison. This design is then used to reveal regional variations in housing inequality. In the follow-up survey, conducted in 2012, about 85% of the households originally surveyed were successfully interviewed again – see Xie and Hu (2014) and Xie et al. (2014) for introductions to the study.

First, we introduce current housing inequality in urban China at the national and regional levels. The measures we will discuss include housing space, facility conditions (e.g., availability of flush toilets, tap water, garbage disposal and electricity supply), types of housing property, the number of houses owned, and rate of housing ownership. We further describe the issues concerning housing values and housing inequality with reference to a resident’s ability to pay for a house with regard to variables, housing price and housing price-to-income ratio (PIR).

The PIR is an international index commonly used to measure a resident’s ability to pay for a house. There are many methods of calculating a PIR; it can be defined as the ratio of median price to median household income and this is used in many studies (Suhaidia et al., 2011). Some researchers use the ratio of median housing
price and median family annual income (Yang, 2003); some calculate the ratio of
total price per household and annual income per household (Jin, 2007); and some
use a weighted average of new houses and second-hand houses divided by the
disposable income of residents and an adjustment coefficient (Chen, 2006). Wu
et al. (2012) suggested that in the United States, and other countries, the standard
formula for the price-to-income ratio in the housing literature is: price-to-income
ratio = (average total price of housing unit)/(average household income), which can
be re-written as PIR = (average housing price per square meter floor area*housing
unit size)/(average per capita income*household size) in China. In this section, the
PIRs at the national and regional level that we calculated are the geometric aver-
ages of the housing price-to-income ratios per household. The computation for-
mula is as follows:

\[
\text{Regional housing price – income ratio} = \exp \left[ \sum \frac{\ln \left( \frac{\text{Each family housing market capitalisation}}{\text{Annual family income}} \right)}{\text{The total number of households in the region}} \right]
\]

In urban China, especially in Eastern cities, housing inequality is becoming very
severe due to the rising prices; equally, it is notable that housing space and facility
conditions have improved greatly in recent years. We will focus on housing
inequality mobility between 2010 and 2012, not only from a macro perspective
but also from a micro perspective at the family level.

Both CFPS 2010 and CFPS 2012 investigated the status of housing difficulties.
Responses such as ‘children of 12 years and above living with their parents in one
room’, ‘three generations sharing one room’, ‘children of different genders and
12 or more years old sharing one room’, ‘beds folded up in the day and unfolded
in the night, or beds set up in the living room’, and ‘other difficulties’ were regarded as
symptomatic of ‘housing with difficulties’. In the absence of such answers, the situ-
atation was then considered ‘housing without difficulties’. We created a categorical
variable indicating dynamic changes of housing with difficulties, based on housing
with or without difficulties in 2010 and 2012.

Lastly, we restricted the samples in urban areas and explored the influence of
household characteristics and regional factors on housing inequality. Variables
included are (1) demographic characteristics of household head: gender, age, age
squared, and education; (2) household environment: family size, dependent ratios –
child ratio (number of children below age 16 in a family) and elderly ratio (number
of people above age 60 in a family), ownership of the house (coded 0 = ‘owned’,
1 = ‘non-owned’), local residence (coded 0 = ‘residents with local hukou’, 1 = ‘resi-
dents with non-local hukou’), family income per capita by quartile group – we
divided households into quartile groups in descending order; and (3) regional vari-
ables: housing PIR, Gini coefficient, log of GDP per capita, and regional dummy
variable – five over-sampled provinces and other 20 provinces. The descriptive statistics for the variables are shown in Appendix A (available online).

**Current housing conditions**

**Housing space and facility conditions**

With regard to provincial differences in living space, there are two opposing views. Some see no major differences in relation to average housing space among regions and cities at all levels, despite the fact that social class differences are extreme (Bian and Liu, 2005). Others believe that housing investment and consumption in China are both characterized by East–West and North–South disparities resulting from urbanization and regional differences in economic development (Dong, 2001). Thus there are significant differences among regions in terms of housing space, especially rural housing space (Yi, 2006).

Table 1 shows the total and per capita construction areas in urban China as a whole and in five regions. To avoid the influence of sample extremes, we used median instead of mean values to reflect average housing space. In 2012 the median value of urban national housing space was 80 square meters. That is to say, half of households were living in houses of less than or equal to 80 square meters, and the other half were living in houses of more than 80 square meters. In terms of regions, housing space in Henan and Guangdong was larger than the national level in 2012; in Shanghai, Liaoning and Gansu it was lower. Because family housing space is now affected by family size, per capita housing areas were calculated and the values are presented in Table 1. In 2012, the median value of national per capita housing space in urban areas was 26 square meters. Henan

<table>
<thead>
<tr>
<th>Housing areas (median, square meters)</th>
<th>Facility conditions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing space</td>
<td>Per capita space</td>
</tr>
<tr>
<td>National</td>
<td>80</td>
</tr>
<tr>
<td>Liaoning</td>
<td>60</td>
</tr>
<tr>
<td>Shanghai</td>
<td>73</td>
</tr>
<tr>
<td>Henan</td>
<td>100</td>
</tr>
<tr>
<td>Guangdong</td>
<td>83</td>
</tr>
<tr>
<td>Gansu</td>
<td>76</td>
</tr>
</tbody>
</table>
province had the highest urban per capita housing space, of 30 square meters, while Liaoning had the lowest, of 23 square meters.

In 2005, the Ministry of Construction proposed the housing targets for the overall ‘xiaokang’ (well-off) society: urban per capita housing space would reach 30 square meters by 2010; urban per capita housing space would reach 35 square meters by 2020; and household housing space in urban areas would reach 100–120 square meters (Policy Research Center of the Ministry of Construction, 2005). According to the ‘xiaokang’ standard of per capita housing space set by the Ministry of Construction, by 2012 more than 50% of all households in urban areas had not reached the standard level. Half of the households in Henan urban areas had reached the ‘xiaokang’ level, but the average levels in urban areas of the other four provinces had not achieved this standard.

Apart from housing space, housing facilities, community environment and electricity supply conditions are also indicators by which housing quality can be evaluated in detail (Wang and Wang, 2010). Housing facilities and regional economic status are closely related to the environment of the village/community. Here, we will evaluate four aspects of urban family housing facilities: toilet facilities, cooking water, garbage disposal and electricity supply conditions. Together with the country’s urbanization development, these aspects of housing facilities have improved considerably. In 2005, tap water availability in urban areas reached 90.2% (Ministry of Housing and Urban-rural Development, 2006), and by the end of 2009 the national hazard-free treatment rate for urban-living garbage was 71.4% (National Bureau of Statistics, 2011).

Table 1 shows that the proportions of non-flush toilets, cooking without tap water, garbage without disposal, and poor electricity supply conditions in urban areas were lower. In terms of regions, more than 15% of urban households in Gansu and Henan had no access to flush toilets, in significant contrast to Liaoning and Guangdong. More than 18% of urban households had no tap water for cooking in Henan, while the proportion was less than 1% in Shanghai and Gansu. More than 6.5% of households in Henan urban areas had no garbage disposal, while in Shanghai only 0.9% were similarly deprived. The percentages of households with poor electricity supply conditions were also low. Generally, the conditions of urban housing facilities in Guangdong, Liaoning, and Shanghai were better than in the other regions: the conditions of housing facilities differed significantly among regions.

Housing with difficulties

Since the Housing Reform in 1988, access to improved housing conditions has increased significantly (Huang, 2003), and the stress of overcrowding has been relieved. However, housing with difficulties still exists.

CFPS 2012 indicated that the proportion of housing with difficulties was 15.2% in urban areas. In terms of regions, the proportions of housing with difficulties in Shanghai, Liaoning, Guangdong and Gansu were 17.3%, 17.7%, 17.6 and 15.9%
respectively, higher than the national level. However, for Henan it was 7.1%, much lower than the proportion at the national level and in other regions, and this is consistent with the previous finding that housing space in Henan was better than in the other four regions.

The 2010–2012 CFPS follow-up study described the dynamic changes of housing with difficulties. Based on housing with or without difficulties in 2010 and 2012, we classified households in four groups: no difficulties, new difficulties, difficulties improved, and constant difficulties (see Table 2).

Figure 1 shows the changes in housing with difficulties among households in urban areas. Between 2010 and 2012 change was generally occurring in the right direction. The proportion of housing with difficulties in urban areas was about 20% in 2010 and it had decreased to 14% by 2012. Nearly 56% of all 501 households that had housing difficulties in 2010 had solved their problems. However, 44% of these households still had housing difficulties in 2012, and 8.8% of the 2047 households that had no housing difficulties in 2010 became...
‘housing with difficulties’ households. The change to this category was affected by factors such as household size, housing space and the living arrangements of family members. Both improvements in housing space and adjustments in family structure are therefore fundamental to solving the problem of housing with difficulties.

**Housing property and the number of houses owned**

**Types of housing property.** China has experienced substantial changes regarding housing property since the Housing Reform of 1988 came into effect. The ownership rate of housing property in urban areas has increased significantly (Zhou, 2006), although disparities exist among social classes in terms of ownership. From non-elites to specialized elites and management elites, the house ownership rates rise in turn. Owning housing property has become an important indicator of economic success (Bian and Liu, 2005). Moreover, ownership of housing property in the big cities has a significant positive effect on individual satisfaction regarding housing and overall ‘happiness’ (Hu, 2013).

The question then arises about how many Chinese families have housing property. A previous study found that in 2000 72% of Chinese urban residents owned houses (Bian and Liu, 2005). In 2001, 82.1% of urban households had housing property, a much higher percentage than the 21% in 1989 (National Bureau of Statistics, 2002), and the housing property ownership rate in urban areas had reached 89.3% by 2010 (National Bureau of Statistics, 2011). Chinese Household Income Project data also show that the ownership rate was about 90% in 2007 (Sato et al., 2013). In contrast, the ownership rate in the United States was 65% in the second quarter of 2013 (US Census Bureau, 2013). Thus the rate of home ownership in China was substantially higher than that in the United States at that time.

The data from the 2012 CFPS show that 87.4% of households owned the complete or partial property of their current housing. The proportions of current housing that were provided by either enterprises or public renting/low-cost renting, were both low, 1.3% and 2.0%, respectively. The past two decades have witnessed the widespread transfer of housing property from enterprises or welfare departments to families. In terms of regions, the rates of families owning housing property in Henan and Gansu were higher than 90%, while the rate in Shanghai was the lowest, at 73.2% (see Table 3). The proportion of families living in houses provided by enterprises and public renting/low-cost renting was much higher in Shanghai than the national level or in the other four regions. We can speculate that this might have been the result of higher housing prices in Shanghai, which made it difficult for families to buy their own houses, or a better welfare system there, which made it easier for low-income families to rent public/low-cost houses.

According to the quartile of household’s per capita net income, we divided all families into the top, middle third, middle second and bottom quartiles, corresponding respectively to high-income, above-median-income, below-median-income, and low-income families. The results show significant disparities among
families with different levels of income with regard to ownership of an entire housing property.

The share of families with various levels of income owning their own houses in urban areas was above 72%. In urban areas, the difference among the lower three social classes was small, and the highest income family had a relatively lower rate of housing ownership (see Figure 2).

Number of houses owned. As a fixed asset, housing accounts for a large proportion of family assets, which can objectively reflect a family’s wealth status. Against

Table 3. Distribution of types of housing property in urban China and five regions in 2012.

<table>
<thead>
<tr>
<th></th>
<th>Own property (%)</th>
<th>Provide housing (%)</th>
<th>Public rental/ low-rent housing (%)</th>
<th>Others (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>76.9</td>
<td>2.6</td>
<td>5.0</td>
<td>15.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Liaoning</td>
<td>76.3</td>
<td>3.4</td>
<td>6.2</td>
<td>14.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Shanghai</td>
<td>68.2</td>
<td>2.8</td>
<td>8.3</td>
<td>20.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Henan</td>
<td>86.9</td>
<td>0.9</td>
<td>2.3</td>
<td>9.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Guangdong</td>
<td>80.7</td>
<td>3.1</td>
<td>3.7</td>
<td>12.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Gansu</td>
<td>85.5</td>
<td>0.9</td>
<td>1.8</td>
<td>11.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 2. Percentage of housing ownership rate by the level of household income in urban China, 2012.

Note: Q1, Q2, Q3 and Q4 denote respectively the top, middle third, middle second and bottom quartiles.
the background of inflating prices of land and houses, a growing number of people in need cannot afford to buy their own homes, while a small number have begun to hoard houses (He, 2011). The segmentation of the housing reform since 1988 has widened the gap between rich and poor and strengthened the division between them in China (Mao, 2010). Zhu et al. (2014) found that even socialized housing options, such as affordable housing and public rental housing, were available mainly to those with advantageous institutional credentials.

Table 4 shows the distribution of ownership of housing at the national level and in the five regions. Here, ‘housing’ includes current housing as well as other houses owned by family members. In 2012, more than 67% of families owned one house, about 14.5% owned more than one house, and more than 18% had no housing property in urban areas.

In terms of regions, families owning one house predominated in all five regions, but the share of families owning more than one house (two or more houses) was highest in Shanghai (21.1%) and lowest in Gansu (12.7%). The percentages of families without housing property in the five regions, from high to low, were as follows:

- Shanghai: 22.2%;
- Liaoning: 20.1%;
- Guangdong: 16.3%;
- Gansu: 12.3%; and
- Henan: 9.9%.

Families in Shanghai thus had the highest degree of differentiation in the number of housing properties among the five regions, with both the highest proportion owning multiple pieces of real estate and the highest proportion owning no real estate. In contrast, the degree of differentiation in Gansu was the lowest, where most families owned only one house, and the proportion of families with multiple pieces of real estate or no real estate was low.

We determined the number of houses owned by families at different levels of income. As Figure 3 shows, a significant difference existed among families at
different levels of income regarding the number of houses owned. The more income the family earned, the more houses they owned, on average. In urban areas the difference between below-median-income and above-median-income families with regard to the average number of houses owned was not significant.

**Housing price and the housing price-income ratio**

*The market value of current housing.* Housing prices are a key problem for urban residents. Generally speaking, housing prices are influenced by disposable income, GDP, population structure and national macroeconomic regulation and control policy (Feng et al., 2010; Li and Wang, 2011). The question of whether the price of Chinese real estate is too high has long been a subject of both societal and academic controversy. Some maintain, for example, that the growth in 2008 of the PIR in ten of China’s cities – Nanjing, Wuhan, Shenzhen, Chengdu, Chongqing, Beijing, Tianjin, Shanghai, Guangzhou and Changzhou – has created a burden on their residents (Wu and Wu, 2009). Some have pointed out that there have been no signs of overpricing in many other cities, although housing prices in China overall increased significantly in 2007 (Wang and Blanc-Brude, 2009). Others do not consider China’s median housing price of two thousand yuan to be high, according to the international evaluation method of housing pricing with median values (STCN, 2012).

We used 2012 CFPS data to describe the distribution of the market value of current housing and the median of the per square meter market value for urban

![Figure 3. Average number of houses by family income level in China, 2012.](image)

*Note:* Q1, Q2, Q3 and Q4 denote respectively the top, middle third, middle second and bottom quartiles.
households at the national level and in the five regions, in order to have a better understanding of the distribution and regional differences in housing prices. Table 5 shows that the median of aggregate market value of current housing for national urban households was 250,000 yuan;\(^8\) that is, at least half of all households' current housing aggregate values were higher than or equal to 250,000 yuan. The median of the per square meter market value of national urban households' current housing was 2587 yuan. Of the five regions, the median of aggregate market value of current housing for Shanghai urban households was 1 million yuan, and the median of the per square meter market value was 15,036 yuan, both higher than the other four regions' medians.

<table>
<thead>
<tr>
<th>Region</th>
<th>Median of aggregate market value of current housing (10,000 yuan)</th>
<th>Median of per square meter market value of current housing (yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>25</td>
<td>2587</td>
</tr>
<tr>
<td>Liaoning</td>
<td>25</td>
<td>3934</td>
</tr>
<tr>
<td>Shanghai</td>
<td>100</td>
<td>15,306</td>
</tr>
<tr>
<td>Henan</td>
<td>27</td>
<td>2308</td>
</tr>
<tr>
<td>Guangdong</td>
<td>20</td>
<td>2174</td>
</tr>
<tr>
<td>Gansu</td>
<td>23</td>
<td>2769</td>
</tr>
</tbody>
</table>

### Relationship between appreciation of housing price and housing space.

Housing prices are rising with the development of the Chinese economy. In this section, we use CFPS 2010-2012 follow-up samples to describe the appreciation of the price of urban families' current housing. It is important to note that ‘price’ refers here to respondents’ estimations of the aggregate current market values of housing in 2010 and 2012, not the actual conditions of a transaction or a reflection of commercial housing prices. Figure 4 shows the predicted relationship between housing space and the market value of current housing in 2010 and 2012.\(^9\) To ensure that the houses from the 2010 and 2012 analyses were the same ones, we set the difference in housing space of the comparable samples at within five square meters and selected families with housing property during the two phases of the investigation.

It can be seen from Figure 4 that the houses of Chinese urban families, of whatever size, appreciated during the past two years; that the prices of houses with an area of less than 100 square meters and areas of 250 square meters and above had increased slightly; and that the prices of houses of median size rose sharply. If an area of at least 90 square meters was considered the standard of improved houses, as seen in Figure 4, these houses have a higher degree of appreciation than houses of fixed demand. Houses of 100–200 square meters, in particular, had appreciated the most.
Distribution of the housing PIR. Here, we consider the ability of urban Chinese residents to pay for a house, with regard to their income levels. Figure 5 shows that the national housing PIR for 2012 was 6.3, and the ratio for Shanghai was 16.4, the highest. The ratios for Henan and Liaoning were higher than the national level.

![Figure 4. The relationship between the market value of current housing and housing space in urban China, 2010 and 2012.](image)

![Figure 5. Housing PIRs in urban China and five provinces, 2012.](image)
while those for Guangdong and Gansu were lower. According to the estimation from the Shanghai E-house Real Estate Research Institute (2012), in 2011 the housing PIR for the nation was 7.4, 12.4 for Shanghai, 9.6 for Guangdong, 6.4 for Liaoning, 5.6 for Gansu, and 5.5 for Henan; these values are similar to the calculation results of CFPS, although Shanghai and Henan were slightly higher, and Guangdong lower. It is important to note that CFPS excluded commercial houses from its calculation of current housing PIRs. Because the ratio is affected by functional conditions, location of the house, and the recent national macro-control of the real estate market, we accept that the estimations from the two sources might differ.

Although housing prices have been booming in many countries in recent years, family income has risen relatively slowly, causing a jump in the PIR (Chen et al., 2007). Because the extent of the income growth rate among social classes was different, it was highly likely that the housing PIRs among social classes would stratify. Studies elsewhere found that the ability of the high-income social class to meet the cost of housing was better, and that the housing PIR was lower, in the high-income social class and higher in the low-income social class. For example, Yang and Ye (2006) reported the subdivision situation in 2004 as follows. The PIR of 26% of the urban population (bottom substrate) was 8.8, that of 23% of the urban population (top substrate) was 7.39; while the PIR of the upper and middle classes (10% of the population) was 4.95. In 2008, the PIRs were 23.68 among the lowest income families, and 2.64 among the highest income families (Yang, 2009). In 2011, the PIR for 20% of low-income families was around 20 (He, 2011).

In accordance with the family income quartile, we analyzed the distribution of housing price-income ratios of different income levels. Using the mean national housing space as a standard, we standardized the housing PIRs of families with different levels of income.

As shown in Figure 6, the PIR for low-income urban families was 22.2 in 2012, which was almost the same value found by He (2011). The ratio for below-median-income families was 11.6, 9.4 for above-median-income families, and 5.4 for high-income families. The ratio for low-income families was 4.1 times higher than the ratio for high-income families. To summarize, the higher the family income, the lower the housing PIR, and thus low-income families faced much greater difficulties in purchasing houses.

The relationship between PIR and inequality in regional economic development and income. Because the level of economic development varies from region to region, housing prices and income levels also differ among regions, as does the housing PIR. According to the data collected from 35 cities in China, a study by Huang and Du found that the relationship between housing price and GDP in China was stronger than that in the United States (Huang and Du, 2010). Furthermore, Yang found that the more the economy developed and the more important the status of the city was, the higher would be the housing PIR (Yang, 2009).
Gini coefficients of income for recent years show that family income inequality has increased dramatically in China. From the housing perspective, however, the Gini coefficients of housing space calculated based on 2010 and 2012 CFPS data were 0.35 and 0.36 respectively, which are much lower than the income Gini coefficient of 0.48 in 2010 reported by the National Bureau of Statistics (2013). The Gini coefficients of housing value estimated from 2010 and 2012 CFPS data, however, were 0.64 and 0.62 respectively, which are much higher than the income Gini coefficient. This means that inequality in housing price or housing quality was much more serious.

We also calculated the housing PIR for the 25 provinces covered by the CFPS and analyzed its relationship with the regional per capita GDP and Gini coefficients. Figure 7(a) shows the relationship between the urban housing PIR and per capita GDP of each province. The fitted curve indicates that the housing PIR was positively correlated with per capita GDP, and that the higher the provincial per capita GDP, the higher was the housing PIR. However, the fitted curve was weighted significantly by Beijing and Shanghai (Figure 7(b)). The relationship would be negative if we excluded these two cities; that is, the higher the provincial per capita GDP, the lower the housing PIR.

Figure 8 shows the relationship between urban housing PIRs and the Gini coefficients of each province. The Gini coefficient was calculated using data for household income in the CFPS. The fitted curve in Figure 8(a) indicates that Beijing, as a special case, significantly affected the relationship pattern. Based on this fitted trend, the conclusion that the PIR was negatively correlated with the Gini coefficient is anomalous. When we treat Beijing as an outlier, the fitted curve in Figure 8(b)
Figure 7. The relationship between PIR in 2012 and GDP per capita in 2011. 
Note: (a) includes Beijing and Shanghai; (b) excludes Beijing and Shanghai.

Figure 8. The relationship between the 2012 PIR and the 2012 Gini coefficient. 
Note: (a) includes Beijing and Shanghai; (b) excludes Beijing and Shanghai.
demonstrates that the housing PIR was positively correlated with the Gini coefficient, and that the higher the Gini coefficient a province had, the higher was the housing PIR. The results indicate that in regions where income inequality was more severe a family would experience greater financial pressure in purchasing a house.

Determinants of housing inequality

We now turn to consideration of the factors affecting the inadequate housing of the household, with particular attention given to the effects of the household characteristics and regional variation we have been exploring. Using an urban subsample of CFPS 2012, we consider here the key factors that influence housing inequality at the levels of household head, household characteristics and regional development. The results are shown in Table 6; these are the estimated coefficients of the logistic regression model on housing difficulties.

Comparing the coefficients of age of household head across the four models, it can be seen that older, lower education, female household heads were more likely to face housing difficulties without other variables; age had a curvilinear effect on inadequate housing and gender was not significant (Model 1). With regard to household-level and regional variables, education is no longer present for the other three models.

With regard to the household-level characteristics, more family sizes, more children and more elderly in a family are significantly associated with the likelihood of housing difficulties arising, even when taking regional development into consideration (Model 2–Model 4). Family size and more children increased the likelihood of having housing difficulties. However, the presence of more elderly members of the household significantly reduced the likelihood of having inadequate housing problems. Whether or not a household has a local hukou has no affect on the likelihood of having housing difficulties. However, the significant related factor is the substantially greater likelihood that those who rent a house or apartment have housing difficulties than do those who own their house. Only those families with below-median incomes have significantly inadequate housing problems compared to those with high incomes (Model 3), and the low-income families are also significantly more likely to face housing issues when we consider regional variations (Model 4).

In terms of regional development, GDP per capita had a non-significant effect on housing difficulties, while PIRs and Gini coefficients were significantly associated with inadequate housing problems (Model 4). The PIRs increased significantly the likelihood of have housing difficulties, whereas the Gini coefficients reduced the likelihood of facing housing problems. Compared with Henan province, the other four provinces were significantly more likely to have housing difficulties. Liaoning province was the most severe, followed by Shanghai and Guangdong. The regional characteristics significantly affected the likelihood of having housing difficulties for Guangdong and Gansu provinces. That is to say, considering the regional characteristics placed the Guangdong serious risk of facing housing problems, and reduced the likelihood in Gansu.
Table 6. Coefficients from the logistic regression of transition to housing difficulties on selected variables (n = 3862), for the year 2012.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (reference = female)</td>
<td>-0.093 (0.092)</td>
<td>-0.123 (0.094)</td>
<td>-0.126 (0.096)</td>
<td>-0.123 (0.096)</td>
</tr>
<tr>
<td>Age</td>
<td>0.076*** (0.021)</td>
<td>0.059* (0.023)</td>
<td>0.077** (0.024)</td>
<td>0.076** (0.024)</td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.001*** (0.000)</td>
<td>0.000* (0.000)</td>
<td>-0.001*** (0.000)</td>
<td>-0.001*** (0.000)</td>
</tr>
<tr>
<td>Education</td>
<td>-0.026** (0.010)</td>
<td>-0.015 (0.010)</td>
<td>-0.005 (0.011)</td>
<td>-0.008 (0.011)</td>
</tr>
<tr>
<td>Family size</td>
<td>0.244*** (0.032)</td>
<td>0.278*** (0.033)</td>
<td>0.278*** (0.033)</td>
<td></td>
</tr>
<tr>
<td>Child ratio</td>
<td>0.753* (0.329)</td>
<td>0.693* (0.339)</td>
<td>0.733* (0.342)</td>
<td></td>
</tr>
<tr>
<td>Elderly ratio</td>
<td>-0.660*** (0.218)</td>
<td>-0.645** (0.224)</td>
<td>-0.669** (0.225)</td>
<td></td>
</tr>
<tr>
<td>Ownership (reference = 'yes')</td>
<td></td>
<td>1.136*** (0.105)</td>
<td>1.101*** (0.106)</td>
<td></td>
</tr>
<tr>
<td>Local residence (reference = 'yes')</td>
<td></td>
<td>-0.003 (0.165)</td>
<td>-0.074 (0.167)</td>
<td></td>
</tr>
<tr>
<td>Quartiles for family income per capita (reference = Q1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td></td>
<td>0.141 (0.123)</td>
<td>0.168 (0.124)</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td></td>
<td>0.289* (0.132)</td>
<td>0.346** (0.134)</td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td>0.241 (0.154)</td>
<td>0.317* (0.157)</td>
<td></td>
</tr>
<tr>
<td>Price-to-income ratio (PIR)</td>
<td></td>
<td></td>
<td>0.032* (0.016)</td>
<td>-8.525** (1.724)</td>
</tr>
<tr>
<td>Gini coefficient</td>
<td></td>
<td></td>
<td></td>
<td>-0.264 (0.237)</td>
</tr>
<tr>
<td>LnGDP per capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regions (reference = Henan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liaoning</td>
<td>1.052*** (0.220)</td>
<td>1.392*** (0.226)</td>
<td>1.366*** (0.231)</td>
<td>1.515*** (0.267)</td>
</tr>
<tr>
<td>Shanghai</td>
<td>0.997*** (0.214)</td>
<td>1.250*** (0.219)</td>
<td>1.138*** (0.228)</td>
<td>1.441*** (0.344)</td>
</tr>
<tr>
<td>Guangdong</td>
<td>0.923*** (0.227)</td>
<td>0.845*** (0.231)</td>
<td>0.819*** (0.235)</td>
<td>1.065*** (0.280)</td>
</tr>
<tr>
<td>Gansu</td>
<td>0.933*** (0.263)</td>
<td>1.039*** (0.267)</td>
<td>1.077*** (0.271)</td>
<td>0.984*** (0.286)</td>
</tr>
<tr>
<td>Others</td>
<td>0.648** (0.200)</td>
<td>0.814*** (0.204)</td>
<td>0.765*** (0.207)</td>
<td>0.793*** (0.213)</td>
</tr>
<tr>
<td>Constant</td>
<td>-3.844*** (0.581)</td>
<td>-4.920*** (0.646)</td>
<td>-6.066*** (0.682)</td>
<td>0.421 (2.833)</td>
</tr>
</tbody>
</table>

Note: (1) Standard errors are shown in parentheses. (2) Q1, Q2, Q3 and Q4 denote respectively the top, middle third, middle second, and bottom quartiles. *p < 0.05; **p < 0.01; ***p < 0.001.
Conclusions

This study presents an empirical consideration of housing inequality in urban China based on data from two separate, nationally representative panel surveys. We summarize our main findings as follows.

1. The median value of housing space was 80 square meters, and per capita housing space was 26 square meters for urban areas in 2012. The conditions of urban housing facilities such as flush toilets, tap water, garbage disposal and electricity supply conditions differed significantly among regions. The conditions in Guangdong, Liaoning, and Shanghai were better than in Henan and Gansu.

2. Of the families surveyed, 14% had housing difficulties in 2012, less than in 2010. About 56% of families with extreme housing difficulties in 2010 experienced some improvement, although 9% of families without housing difficulties in 2010 had new problems, with overcrowding, in 2012.

3. In 2012, 77% of all urban households owned their own houses, and the proportion of families living in houses provided by enterprises and public renting/low-cost renting was low (7.6%). More than 85% of families in Henan and Gansu had their own houses; Shanghai had the lowest proportion. The proportion owning their own houses among the high-income families was significantly lower than that among low-income, below-median-income and above-median-income families.

4. More than 67% of families owned one house, and more than 15% of families had two or more houses. With regard to the number of houses owned, Shanghai differed most significantly from the other four regions, as shown by the high proportion of families with no real estate and families with multiple pieces of real estate. Gansu had the lowest degree of differentiation. In terms of social class stratification, high-income families tended to have more real estate.

5. The current median market value of housing was 250,000 yuan for urban households, and the median per square meter market value was 2587 yuan. Of the five regions, the median aggregate market value and the median per square meter market value were both highest in Shanghai.

6. In 2012, the national housing PIR was 6.3: the ratio for Shanghai was 16.4, the highest of the five regions studied. In terms of social class stratification, the housing PIR of low-income families was much higher than that of high-income families, which indicated that low-income families encountered more difficulties in seeking to improve their housing conditions against a background of high housing prices. With regard to regional differences, the higher a province’s per capita GDP, the higher was its housing PIR. If Beijing and Shanghai are excluded from the model, the opposite would be true; that is, the higher a province’s per capita GDP, the lower its housing price-income ratio. Furthermore, the higher a province’s level of income inequality, the higher was its housing PIR.
Two questions arise:

- Which were the key factors that influenced housing inequality from among the characteristics of households and regional development?; and
- What was the mechanism affecting the inadequate housing problems?

As suggested by the results from logistic regression on inadequate housing problems, age was a significant variable at the level of household head. In terms of household-level characteristics, family size and dependent ratio of children had substantially negative effects on improving housing conditions; the dependent ratio of elderly, however, had a positive effect on alleviating housing difficulties. At the household economic level, owning its own house significantly alleviated a household’s housing difficulties; having a local hukou had no impact on the likelihood of facing housing problems; and lower-income families were more likely to face housing difficulties.

With regard to regional indices, PIRs and Gini coefficients had a significant association with housing difficulties. Regional income disparities and PIRs affected significantly the likelihood of having housing problems for the lower- and below-median-income families. This is particularly surprising given that the Gini coefficient was more likely to reduce the likelihood of housing difficulties; it may be attributed to a much higher proportion of the housing ownership rate. Income from renting houses not only increased the gap between those who owned their own houses and those who rented houses or apartments, but also appeared to be better off in housing conditions for those who owned houses. GDP per capita had no effect on housing inequality. Finally, it should be noted that the dataset used precludes definitive answers to some of the questions we attempted to address here. We suggest that the causal relationships between regional economic development, economic inequality and housing price pressure need further study.

Acknowledgements
The data used in this paper are taken from the China Family Panel Studies, funded by the 985 Program of Peking University and carried out by the Institute for Social Science Survey of Peking University.

Funding
The research was supported by a grant from the National Natural Science Foundation of China (71373012).

Notes
1. The average annual housing investment constituted only 0.78% of China’s GNP during 1949–1978 (Huang, 2003).
2. The data for 1997 were taken from the government work report made by Premier Rongji Zhu in the First Session of the Tenth National People’s Congress (See: http://
The data for 2011 were taken from Zhao and Chen (2012).

3. A Chinese expression adopted from a TV soap opera: it means that people live in very crowded conditions, comparable to living in a snail’s shell.

4. A Chinese expression which means that people live in crowded conditions, resembling ants.

5. Here we regard toilet facilities, cooking water, garbage disposal and electricity supply conditions as indicators measuring housing facilities conditions.

- We grouped the toilet types into two categories: 1 for flush toilet, including indoor flush toilet, outdoor private flush toilet and outdoor public flush toilet; 2 for non-flush toilet, including indoor non-flush toilet, outdoor private non-flush toilet, outdoor public non-flush toilet, and others. The type of non-flush toilet in Table 1 refers to category 2.

- We grouped the types of cooking water into two categories: 1 for tap water, including tap water and mineral/purified/filtered water; 2 for non-tap water, including river/lake water, well/spring water, rainwater, cellar water, pond water, and others. The type of non-tap water in Table 1 refers to category 2.

- We grouped garbage-dumping behaviors into two categories: 1 for garbage with disposal, including public dustbin/garbage can in the trash area of the building, with someone coming to collect it; 2 for garbage without disposal, including brooks nearby, around the house, pits, anywhere in the open area and other areas. The type of garbage without disposal in Table 1 refers to category 2.

- We grouped electricity supply condition into two categories: 1 for good electricity conditions, including occasional power outages and almost no power outages at all; 2 for poor electricity conditions, including no electricity and frequent power outages. The type of poor electricity conditions in Table 1 refers to category 2.

6. International studies on the status of property rights formerly used the indicator of ownership rate. Although ownership rate is not the same as the proportion of residents owning a house property the proportion owning house property is neither equal to the proportion owning their homes, nor is it equal to the proportion owning housing with the proportion of the current housing. However, ownership rate is generally increasing together with the increase in the proportion of residents owning housing property (Wang, 2008), so ownership rate was used as a reference standard in this section.

7. Either entire or partial housing property is regarded as houses owned by family members.

8. Most domestic research studies on housing prices focus primarily on the housing prices of new urban real estate, while the CFPS emphasized families’ current housing, which contains both new and old houses, the market values of many older homes being relatively low. Therefore, compared with studies of housing prices of only new houses, the median of market value and per square meter of current housing in this study were lower.

9. OLS regression was used in the prediction model. The dependent variable of the model was the logarithm of housing prices; key independent variables were the logarithm of housing space and square of logarithmic housing space (statistically significant); and the provincial per capita GDP was the regional control variable. In Figure 4 the provincial per capita GDP was set to the mean value.
10. See Xie et al. (2013) for a study of income distribution.
11. The missing, the minimum and the maximum values of housing space, market value per square meter, and family net income were excluded.
12. The standardization of housing PIR: housing PIR (families of different levels of income) = (mean of national housing space) x (mean of per capita market value of families at certain income levels) / (mean of net income of families at certain income levels).
13. Previous studies classified income into seven levels when analyzing the relationship between income level and housing price-income ratio (Yang, 2009). Because we classified income instead into four levels, the housing PIR of the high-income families in this section was higher, compared with previous studies.
14. For the Gini coefficients of housing space and housing value, we excluded the missing values and some outliers.

References


