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Housing affordability and housing vacancy in China: The role of income inequality

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ABSTRACT

China's urban housing price has dramatically increased in the past decade, surpassing income growth and raising fears of a real estate bubble. The increase in housing price is also accompanied by a growing number of vacant apartments. This paper argues that income inequality is one important factor driving up both the housing price relative to income and the housing vacancy rate. Using data from China's Urban Household Survey, the paper empirically examines the effects of income inequality on the housing price-to-income ratio and housing vacancy rate within each city. We find that the income GINI coefficient is positively related to the housing price-to-income ratio as well as the housing vacancy rate. In particular, a one percentage higher GINI coefficient is associated with increases in the housing price-to-income ratio and housing vacancy rate of 0.026 points and 0.166 percentage points, respectively. During 2002 and 2009, approximately 6% of the increase in the housing price-to-income ratio and 10% of the increase in the housing vacancy rate can be attributed to the increase of the GINI coefficient. Further studies show that the development of the capital market and housing rental market are somewhat helpful in mitigating the associations between income inequality and the housing price-to-income ratio and vacancy rate.

1. Introduction

The urban housing price in China has dramatically increased since the housing monetary reform around 1998, which substantially outpaces the household income growth. During the past decade, the average real housing price for the 35 major cities in China has been growing at an annual rate of around 17%, while the real GDP of these cities only grows at an annual rate of 10%. The increase in the housing price leads to an abnormally high level of housing price-to-income ratio (hereafter, *HPIR*). It is estimated that the average *HPIR* for the 35 major cities was 10.2 in 2013.[1] Besides the rise in the housing price-to-income ratio, the urban housing vacancy rate (hereafter, *HVR*) has also been rising during the past decade, leading to the so-called "ghost town" phenomenon. A recent household survey by China's Southwestern University of Finance and Economics estimated that the *HVR* in China's urban areas was approximately 22.4% in 2013. The increases in *HPIR* and *HVR* have led to concerns on a housing bubble and a potential crash of the housing market. The high *HVR* also reflects a severe resource misallocation. Besides the economic concerns, the increase in *HPIR* has made houses unaffordable for a large number of middle and low income households, which makes it a political and social issue.

Although a rapid development in the housing market is not surprising for a transition country like China, it is unusual to witness a sustained growth of housing price relative to income that coincides with an increasing number of empty houses. On the one hand, housing is becoming more and more unaffordable for the average Chinese household. Consequently, many urban households live in crowded houses or share a small rental apartment with others, who are often labeled by the media as "city ants." On the other hand, some households have multiple apartments but only live in one of them. The coexistence of a large population of "city ants" and a large number of vacant apartments is puzzling.

In this paper, we argue that an underlying cause of the increases in *HPIR* and *HVR* in China's urban areas is the deterioration of China's income distribution. As a normal good, the demand for housing should increase with income. In an economy with limited investment opportunities and inadequate private land property rights, housing becomes a desirable asset for investment purposes. As a result, the income elasticity of demand for investment

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[1] *Source:* Report released by the E-House China R&D Institute, 2014-5-26.

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purposes is higher than the elasticity for residential purposes and decreases very slowly as income goes up. In a competitive housing market, higher income inequality results in more houses being owned by high-income households and consequently a higher *HVR*. In the meantime, the income increase of wealthy households drives up the equilibrium housing price since the price is determined by the marginal buyers, and thus the *HPIR* goes up with income inequality (Matlack and Vigdor, 2008).[2]

Our paper is one of the first to investigate empirically the role of income inequality in housing affordability and housing vacancy problems in China. Most previous studies about China's housing market have endeavored to explain why the housing price increases so fast. For example, Wei et al. (2012) show that the high housing price in China's major cities is due to the high household saving rates resulting from an unbalanced sex ratio. Garriaga et al. (2014) explored the role of rural-urban migration in China's urban house price dynamics, especially in Beijing and Shanghai.

The idea that income inequality is associated with housing prices has been documented in the literature. Previous studies, for example Rodda (1994), Quigley et al. (2001), and Quigley and Raphael (2004) have shown a positive relationship between the income inequality and housing price. More closely related to our study, Matlack and Vigdor (2008) provided a theory to link income inequality to the housing affordability and test the relationship empirically using the U.S. data. They argued that the relationship between income inequality and housing affordability is negative for low income households in partial equilibrium but ambiguous in general equilibrium, and found empirical evidence supporting the partial equilibrium argument. This paper improves the existing literature by investigating how China's urban inequality influences both housing affordability and the housing vacancy rate.

We firstly construct a city level panel data from 2002 to 2009 based on original household level data of *China's Urban Household Survey* (CUHS) and then use successively OLS, two-way fixed effects (FE) estimation strategy and system GMM method. We obtain consistent results across various model specifications. Specifically, results from our FE estimations show that a one percentage point increase in the income GINI coefficient is associated with an increase in *HPIR* by 0.026, and an increase in *HVR* by 0.166 percentage points. Simple calculations show that approximately 6% of the increase in *HPIR* and 10% of the increase in *HVR* during 2002 to 2009 can be attributed to the increase in the income GINI coefficient, i.e. holding all other factors fixed. Our findings suggest that the rise in *HPIR* and *HVR* in China's urban areas is associated with the deterioration in the income distribution. Redistribution policies can reduce the income inequality, as well as increase the housing affordability for the middle and low income families, thereby reducing the *HVR*. Further findings suggest that the development of the capital market and the housing rental market are helpful in mitigating the relationship between income inequality and the *HPIR* and *HVR*.

The rest of the paper is organized as follows: Section 2 provides a simple model linking the income inequality to *HPIR* and *HVR*; Section 3 introduces the data and the empirical methodology; Section 4 presents the main results; Robustness check and further discussions are presented in Section 5; Section 6 concludes.

2. A simple model

In this section, we provide a simple partial equilibrium model of local housing market to illustrate why the rise of income inequality can lead to increases in *HPIR* and *HVR*. Without loss of generality, we assume two types of households in each city: high income households (H) and low income households (L). The total number of households is standardized as a unity, with the proportion of H-type household denoted by θ. We assume $0<\theta<1/2$, i.e. high income households is the minority in each city. The total income of all households is denoted by Y, with the total income proportion of H-type households as γ. By definition, we have $1/2<\gamma<1$. After simple calculations, we have the GINI coefficient G, equals γ-θ.

Next, we assume the utility functions for H-type and L-type households take the same form, i.e. $U(x,y)=x^{\alpha}y^{1-\alpha}$, where x denotes the size of houses, y denotes all other consumptions. Meanwhile, the unit price of houses denoted by p, while the unit price of other consumption goods is normalized to a unity. Finally, we assume the supply function of housing is linear in price, i.e. $S(p)=bp$, where $b>0$.

Solving the utility-maximization problem of the household, we obtain the housing demands of H-type households and L-type households as follows:

$$x_H=\frac{\alpha\gamma Y}{p\theta};\quad x_L=\frac{\alpha(1-\gamma)Y}{p(1-\theta)} \tag{1}$$

Consequently, the aggregate housing demand in the city is:

$$D(p)=\theta x_H+(1-\theta)x_L=\frac{\alpha Y}{p} \tag{2}$$

Since the size of one single house cannot be unlimitedly large, we assume an upper limit of house size, ε. As a consequence, if the housing demand of one household is larger than ε, the household buys two houses or more. Without a loss of generality, the upper limit of each house is assumed to take the form of $\varepsilon=\alpha Y/p$, which coincides with the housing demand of a representative household when the income is the same among all households.[3] Thus we obtain the area of vacant houses of household i, say V_i, as follows:

$$V_i=\max\{x_i-\varepsilon,0\} \tag{3}$$

In equilibrium, we have the housing price p and aggregate housing demand X as follows:

$$p=\sqrt{\frac{\alpha Y}{b}},\ X=\sqrt{abY} \tag{4}$$

The *HPIR*, R, defined as the equilibrium housing price p, divided by the median household income, is:

$$R=\sqrt{\frac{\alpha}{bY}}\left(1+\frac{G}{1-\gamma}\right), \tag{5}$$

and the *HVR* can be calculated as:

$$VR=\frac{V}{X}=\frac{[x_H-\varepsilon]\theta}{X}=\frac{G\varepsilon}{X}=G \tag{6}$$

From Eqs. (5) and (6), we can see that an increase in income inequality (larger G) will lead to an increase in both *HPIR* and *HVR*.

How to intuitively interpret this theoretical framework? The housing price and aggregate housing supply in equilibrium is determined by the overall income, while the median income is largely affected by the low income group, who account for the majority of the population. As a result, the ratio of housing price to income is negatively correlated with the median household income

[2] It is acknowledged that this simple argument is only valid in partial equilibrium, as shown in Matlack and Vigdor (2008), the theoretical prediction could be ambiguous in general equilibrium. Whether the increase of income inequality can lead to increase of housing price-to-income ratio is really an empirical question.

[3] This assumption is equivalent to assuming that all houses are constructed according to standardized size in the city, so that households whose income lies below the average level can share the houses by "renting". In reality, for the sake of saving costs of design or pipelines, houses are indeed provided in standardized units, while different categories of income may correspond to multiple types of standardized area.