

# The Determinants of Housing Prices: Evidence from Chinese Cities

Wanli Yang

University of California, Santa Barbara, United States

**Abstract.** With the rapid growth of China's economy, the urbanization process is accelerating, and urban development is getting faster and faster. Housing prices have become a concern for more and more residents. This paper empirically studies the determinants of housing prices, including population, region, land factors, and government fiscal measures. Multiple linear regression models interpret the economic implications of empirical results by collecting unique data sets from multiple sources. The results show that government fiscal revenue, real estate investment, and land value positively correlate to housing prices. This article makes insightful comments on the above analysis, which is significant to the government, real estate developers, and residents. To a large extent, the government can take measures to adjust the housing price and solve the housing problem. Achieve the purpose of sustainable development.

**Key words:** Housing price; Determinants; China; Sustainable development.

## 1. Introduction

This article examines the factors contributing to the rise in China's housing prices over the past few years. China's real estate market is an emerging market that has developed rapidly and reformed heavily in the past two decades, so China is a good case study. As the most populous country in the world, China has the largest population in the world. In recent years, the level of urban and rural urbanization in China has been increasing, but under this rapid economic development, there are also some hidden dangers. As the gap between urban and rural areas is too large, the disparity of various social and public resources leads many rural people to settle in cities. According to the census data, the proportion of the urban population in China's total population was 17.9% in 1978 and increased to 29% in 1995. By 2014, the ratio of the urban population in China had risen to 54.77%. With such a rapid increase in urban population, the demand for housing is bound to increase sharply, and the rapidly growing demand for housing is bound to increase the housing price. On the other hand, part of the government's revenue comes from selling land-use rights. China's provinces and municipalities now rely too heavily on land transfer fees and borrowed funds to meet their fiscal spending needs. With the rise of land prices, real estate companies are raising the housing price to ensure their profits, finally forming a semi-deformed Chinese economy kidnapped by real estate. Government policies are also contributing to rising property prices. For example, in April 2001, China launched a land banking system that turned multiple sources of land supply into a

single source. In this system, as the sole supplier of land, the government controls the quantity and structure of land supply. However, these land policy reforms primarily aim to stabilize China's housing and land prices and promote the development of China's real estate market. However, the land banking system allows the municipal government to obtain high revenues from the sale of land-use rights by arbitrarily controlling the land supply, thus driving up land prices. As a result, these land policies failed to control housing prices well, and China's housing and land prices rose sharply. By studying four municipalities directly under the central government and 282 prefecture-level cities in China from 2011 to 2018, this paper constructs samples with 2,882 observed values. It uses the multiple linear regression OLS model to analyze the relationship between land price, GDP, government fiscal revenue, and other factors and housing prices. The remainder of this article is organized as follows. The second part briefly reviews the relevant literature on the factors affecting housing price. The third part introduces the background and data of this empirical study. The practical strategy and results are covered in Section 4. The final section discusses policy implications and provides some concluding comments useful for future government policies regulating housing prices.

## 2. Literature review

In recent years, with the rapid development of Chinese cities, high housing prices have become a more concern of the society and the masses and also become the

essential research objects of scholars, Abraham (1994) put forward actual determinants of house price appreciation can be divided into two groups, a group of explaining the change of the equilibrium price, another group of explaining dynamic changes or deviation from the equilibrium price adjustment. When studying the fundamental determinants of housing prices, Adams (2010) proposed that housing demand and supply largely determine housing prices through panel cointegration data analysis of 15 countries over 30 years. The demand side depends on the ability of households to pay housing or mortgage loans. Specifically, house prices depend on the following aspects:

Housing prices will also change because of demographic changes. Li & Liang (2022) studied 35 sample cities in Northeast China, a typical rust belt, and found that the increase in housing demand caused by population growth was usually accompanied by more housing demand, while the decrease in population did not lead to a significant decline in housing demand.

Regional factors also affect changes in house prices. Luo & Yao R. (2021) studied the sales prices of commercial apartments and houses and the geographical coordinates of corresponding residential areas. The hedonic price model found that the most influential factors on housing prices were the location of apartments or houses, the quality of nearby higher education resources, and the proximity to public transportation services. Xiao & Guo. (2017) used the eigenvector spatial filtering method to eliminate the spatial autocorrelation effect, analyzed housing and urban amenities data, and drew the conclusion. The impact of nearby amenities on house prices is mixed. While proximity to specific amenities is positively related to house prices, other supermarket-like amenities variables are negatively related.

Monetary policy, as an essential means of macroeconomic regulation and control, also plays a vital role in regulating housing prices. Xu & Chen (2012), based on the influence of key monetary policy variables such as long-term benchmark bank loan rate, money supply growth, and mortgage credit policy indicators, proposed that expansionary monetary policy would often lead to housing price growth while restrictive monetary policy would slow down housing price growth. Ma & Kirikkaleli. (2021) used the continuous wavelet coherence method to show further a significant positive correlation between China's money demand and the housing price index. Therefore, the monetary policy mortgage interest rate can be used as a long-term financial tool to regulate the dynamics of housing prices, which can help the government to control better housing prices( Duan & Zhou, 2021).

The land is closely related to housing prices as a prerequisite for the real estate market. Ihlanfeldt (2007)supports that relaxing land restrictions can ease housing pressure and lower housing prices. Yi & Wong (2022) studied the long-term relationship between land supply and housing prices in China, which further confirmed that increasing land supply would help reduce housing prices to a certain extent.

### 3. Data description

#### 3.1 Data collection

This article will use the China Statistical Yearbook compiled by the National Bureau of Statistics. The annual report on economic and social development is conducted by the National Bureau of Statistics of China. It looks at house prices in all Chinese cities. The database covers four municipal cities, i.e., Beijing, And 282 prefecture-level cities, which constructs a sample with 2,882 observations.

#### 3.2 Summary statistics

Table 1 reports the descriptive statistics of key variables.

Table 1 Descriptive statistics of key variables

Variable	Label	Obs	Mean	Std. Dev.	Min	Max
Registered population	Registered population (10 <sup>3</sup> )	2,288	4399.717	311.713	195	3392.1
Residential population	Residential population	2,288	440.653	383.892	21.09	9873
House price	house_price	2,288	4613.647	296.3725	275.776	4514.6263
Land value	land_value	2,288	1027.877	159.392	20.37	2605.0371
GDP	GDP	2,288	205.296	279.36	8.793	2817.865
Disposable income	Disposable income	2,288	2264.8008	743.8821	194.0	5434.1
Housing investment	Housing investment	2,288	1731.051	282.0998	6.92	2451.366
Government receipts	Government receipts	2,288	2035.24	451.7768	35.29	6406.13
Sales area	sales_area	2,288	399.096	508.118	.9	6257.146

As shown in Table 1, the sample number of variables is 2288. Res pop is the number of residents (unit: 10,000). As seen from the table, the number of residents has a wide range. Due to the large gap in infrastructure between the first and second-tier cities, young people are more inclined to live in highly developed cities, so there is a big difference between different regions. China has a large population base, with an average of nearly 4.4 million residents. Land value is the price per hectare of land. In terms of price, due to their different economic development level and social status, countless people flood into first-tier cities every year, which brings not only

countless talents to the city but also brings tremendous competitive pressure, and the constant change of supply and demand also brings the increasing housing price. This is also the reason for the big difference in housing prices and land prices among cities, whose average values are 4613.647 (commercial housing sales volume (billion yuan)/ commercial housing sales area (unit :1 million square kilometers)) and 10,278.877 (Yuan /hectare) respectively. For price determinants, we have Gov rec, the government's annual revenue, in tens of millions of dollars. Room money refers to the funds used for housing investment in real estate development. The unit is 10 million yuan. Compared with third-tier cities, first-tier cities concentrate more on advanced industries, which is helpful to the income increase to a large extent. People's income level is generally higher than that of third-tier cities, and the variability of the income gap is as high as 7,438.821 yuan, indicating that the existence of income inequality is severe. Sales areas also vary significantly from city to city. The minimum sales area can be as small as 9,000 square meters, while the city with the largest sales area can sell 6,257.146 square meters.

#### 4. Econometric model

Following the multiple linear regression OLS model, I employ a logarithm form of residential population, land value, house investing and government receipts is taken as the dependent variable to conduct the regression with house prices. The baseline specification becomes:

$$\ln(Y_{it}) = \theta_0 + \theta_1 X1_{it} + \theta_2 X2_{it} + \delta_t + \varepsilon_{it} \quad (1)$$

where Y is the effect which is quantified, residential population, land value, house investing, government receipts in that year. X2 is house prices.  $\delta_t$  is yearly fixed effect that control for unobserved attributes over time. Standard errors are clustered at the district level.

#### 5. Empirical results

Table 2 Empirical results of effect on economy and environment

	Column 1	Column 2	Column 3
<b>variables</b>	ln_house_price	ln_house_price	ln_house_price
<b>In_Res_pop</b>	-0.1602*** (0.0122)	-0.1519*** (0.0131)	-0.0948*** (0.0133)
<b>In_land_value</b>	0.3807*** (0.0122)	0.2905*** (0.0103)	0.2522*** (0.0103)
<b>Ln_Gov_revenue</b>	0.1108*** (0.0104)	0.1115*** (0.0104)	0.0565*** (0.0084)
<b>Ln_House_investment</b>	0.0627*** (0.0103)	0.0735*** (0.0122)	0.0913*** (0.0118)
<b>Constant</b>	6.1839*** (0.0611)	6.1657*** (0.0619)	2.2102*** (0.3004)
<b>Year FE</b>	Y	Y	Y
<b>R<sup>2</sup></b>	0.5856	0.6059	0.6349
<b>N</b>	2288	2288	2288

Table 2 shows the empirical results with year-fixed effects. In column (1), the coefficient on Residential\_population is -0.1602. If the Residential\_population increases by 1%, the house price decrease by around 16%. If the land value increases by 1%, the house price rises by around 38%. This is because the data needed to take into account second-hand houses. Although the housing stock was increasing, the newly added population could not afford to buy the new house and turned to rent second-hand houses. This happened at the same time as the land price increased, resulting in the decline of the housing price. The price of land is closely related to the price of housing. The increase in land price increases the cost of building houses, leading to rising housing prices. Government fiscal revenue also has a positive relationship with housing prices. In addition, due to the high competitiveness of the housing market, real estate companies invest more money to develop better buildings. With every 1% increase in housing investment, the housing price will also rise by 6%. Its p-value is less than 1% and is statistically significant. In column (2), the main results are similar. In column (3) with the complete model, compared to columns (2) and (3), we find that The government sells high-priced land to increase fiscal revenue, while the high land price leads to the rise of housing prices. In addition, due to the high competitiveness of the housing market, real estate companies invest more money to develop better buildings. In a word, the change in housing price is related to many factors, whether land price or the input of real estate and housing price has a positive correlation. The government also relies on buying and selling land for much revenue.

#### 6. Conclusion

According to the survey results, it can be concluded that the main factors affecting the rise of housing prices are (1) residential population, (ii) Land value, (iii) government revenue, and (iv) Investment by real estate developers, through four municipal cities, i.e., Beijing, and 282 prefecture-level cities, which constructs a sample with 2,882 observations. A multiple linear regression equation is used to study the causal relationship between these factors and housing prices. China's real estate price has constantly fluctuated and risen in recent years. China's residential land supply as a percentage of total land supply is the lowest among major countries, and residential land prices remain high. Due to the GDP assessment and policies of local governments, China has allocated ample urban land for commercial and industrial land. Commercial and industrial land will bring continuous tax revenue and GDP growth, increasing the government's fiscal revenue but reducing China's residential land. The unreasonable land supply structure in China's first-tier cities has caused massive pressure on commercial housing sales. So the structure of urban land use needs to be improved. The differentiation among cities is also apparent. Housing prices in first-tier and second-tier cities, especially first-tier core cities, are rising due to industrial development, population migration, and better medical, education, and pension conditions. The imbalance

between supply and demand is also why house prices continue to rise. On the one hand, it is due to the insufficient land supply. On the other hand, the demand for housing increases continuously. Due to the high market competitiveness, real estate enterprises need to invest more money to increase the fundamental measures in the community, such as a better green environment, which also leads to higher profit returns for real estate enterprises, leading to the further rise of housing prices. Because of the long-term structural problem of the real estate industry, our country has also introduced several measures to regulate. However, the Chinese real estate market has emphasized demand regulation for a long, and the long-term effect needs to be apparent. We should continue to adhere to the real estate regulation policy to the combination of supply and demand regulation: on the one hand, through various means at the demand side of strict regulation; On the other hand, increase the supply of land on the supply side. At the same time, through the development of the economy, we can continuously improve the residents' income level, make the growth of residents' income exceed the rise of the house price for a long time, and shrink the ratio of house price to income to solve the problem of excessively high house price fundamentally.

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