

Evaluating the Rationality of Land Share of Housing Value in China's Urban Housing Market

—Based on International Comparison and Risk Analysis

Xiaoping Zhou
School of Government
Beijing Normal University
Beijing 100875 China

Zhenyang Qin
School of Government
Beijing Normal University
Beijing 100875 China
*Corresponding author

Duo Chai *
School of Government
Central University of Finance and Economics
Beijing 100081 China

Song Zhao
China Land Surveying and Planning Institute
Beijing 100035 China

Abstract—Land share of housing value is an important indicator linking land market and housing market. However, few studies have comprehensively discussed the rationality of China's land share of housing value. This paper first defined the rationality of land share of housing value as being consistent with international experience and meeting the needs of China's socio-economic stability. Then, this paper drew the following conclusions through international comparison and risk analysis: Firstly, China's current land share is at intermediate level among developed countries' historical values. Land share's trend, spatial distribution characteristic and relationship with urban socio-economic fundamentals in China are also similar to those in developed countries. Secondly, under the two hypothetical scenarios, through the "stress test", it is found that the land share of most 35 large and medium-sized cities will not cause economic risks. Therefore, land share of housing value in China is generally reasonable, and the reasonable range is roughly 31.18%-57.91%. The land management department should dynamically adjust the land supply plans and control land share at a reasonable level from the perspective of preventing economic risks.

Keywords—Land Share of Housing Value; International Comparison; Risk Analysis; Rationality

I. INTRODUCTION

In recent years, housing prices and residential land prices in most cities in China have continued to rise, causing social concerns about the real estate bubble. There is a view that the rapid rise in housing prices is due to the high land price and the reasonable proportion of land prices to housing prices. The most famous discussion on the relationship between land price and house price is the Grigson-Evans debate. Grigson believes that the price of land products determines the price of land. In the real estate market, it is the price of housing that determines

the price of land. O Sullivan also believes that the demand for land is caused by the demand for housing. When the economic supply of land is limited, its price is more determined by demand. High land price is the result of high house price. Evans argues that there are two hypotheses in this conclusion, namely, the land supply is unchanged and the land use is unique. If the supply of residential land is changeable, when the supply of residential land increases, the development of new houses will increase the supply of housing, which will also have an impact on housing prices. Therefore, the relationship between land prices and housing prices needs to be combined with the planning and control of the land market ^[2]. In empirical research, different scholars draw different conclusions. Some studies believe that the signal of high land price generated by land market will continuously increase house prices through the "expected cost effect" of investors. There are also studies pointing out that the causal relationship between land price and house price is different in the long run and short run ^{[4][5]}. Other studies suggest that land prices and house prices are interrelated ^{[6][7]}. Although the above research has not reached a consensus conclusion on the causal relationship between land price and house price, it can at least confirm that land price and house price interact, which also shows the importance of studying land share of housing value. On the one hand, we can predict the future market trend according to its changes; on the other hand, we can timely detect and control risks. Especially for China with public ownership of land, because the government controls the supply of land, land share of housing value has guiding significance for the government to improve the accuracy of land supply. However, for the land share of housing value, which is an indicator connecting the land and real estate market, there is a lack of relevant domestic research. There are only some estimates of the land share of housing value and simple international comparison. For example, Song Bo and Gaobo (2007) estimated the land share of housing value of 29 cities in China from 1999 to 2006, and found that it was close to the situation of the United States and Sweden, which were

relatively rich in land resources, and far lower than that of the developed countries and regions in Asia where land resources were scarce^[8]. Zhang Qingyong (2007) compared land share of housing value in the United States, Britain and other countries with land share of housing value in eight big cities of China from 2002 to 2005, and considered that land share of housing value in many cities of China was not very high^[9].

To sum up, there are still some shortcomings in the study of China's land share of housing value. Firstly, few studies have discussed the rationality of China's land share of housing value comprehensively. Secondly, there are some shortcomings in the methods of comparison between China and other countries. Due to the different stages of economic and social development at home and abroad, it lacks reference value to compare the current values of China with those of other countries. Finally, the data used in existing studies only cover a few cities. The innovation of this paper lies in the following three aspects: Firstly, the definition of rationality is defined clearly, and the rationality of land share of housing value is discussed from three perspectives: historical value of land share in foreign countries, international experience and domestic economic risk. Thirdly, the land share of housing value data used by our study are derived from China's urban land price dynamic monitoring system, which are based on the monitoring data of micro-samples, avoiding the deviation caused by the difference of land price and housing price samples in macro-data.

II. RESEARCH METHOD

A. Definition of Rationality

At present, there is less discussion about the reasonable range of land share of housing value, and there is no clear standard in the world. The development of real estate market in developed countries is in a relatively mature stage, and the empirical value of land share has certain reference significance for China. However, there are obvious differences in land system, population and resources between China and foreign countries. The judgment of rationality needs to be combined with China's specific conditions. Therefore, this paper argues that rationality should include not only the approximation of absolute values, but also the approximation of characteristics. This study divides the rationality of land share of housing value into three criteria: first, the current value of land share in China is similar to that of developed countries in the similar development stage. Secondly, the characteristics of the land share, i.e. the evolution trend, the spatial distribution characteristics and the relationship with the urban fundamentals, are close to that of the developed countries at present. Third, the current land share of housing value will not pose risks to future economic operation. Satisfying the above three conditions, it is considered that the current land share of housing value is reasonable.

B. Construction of Comparing Framework and Selection of Comparing Objects

This study chooses countries similar to China's national conditions as a reference, and constructs a comparative analysis framework of the value and operation characteristics of land share of housing value from history to current situation, from time to space and from macro to micro. (1) Select the

historical stage of developed countries which are close to the current level of economic and social development of China to compare land share of housing value; (2) Compare the time-varying trend of land share of housing value between China and foreign countries; (3) Compare the spatial distribution of land share of housing value between China and foreign countries at present; (4) Compare the relationship between land share of housing value and urban fundamentals at home and abroad. This study mainly chooses the United States, European countries and Japan as reference objects, mainly considering the following reasons: First, the urbanization process of the United States, European countries and Japan has basically been completed, the real estate market is relatively mature, and can provide more historical comparative samples. Secondly, the United States has a large land area, a wide urban distribution, and there are certain development differences between regions, as well as between coastal and inland areas, similar to China's situation. Thirdly, Japan's land area is small, land resources are scarce, population density is high. The relationship between population and land resources is close China. Fourthly, the availability and reliability of the above-mentioned national statistical data are high.

C. Thoughts on Risk Analysis of Ratio of Land Price to House Price

Because there are some differences in land system and market environment between China and Western countries, it is difficult to judge whether land share of housing value in China is reasonable only by comparing with the situation in Western countries. Therefore, this study further explores whether the land share is reasonable for China from the perspective of risk prevention, especially economic risks. From the perspective of mechanism, the high land share of housing value mainly reflects that compared with housing price, the high land price as a cost may threaten the profit of real estate development enterprises, and then cause project financial risk. Because most of the funds of real estate development enterprises are loans from various financial institutions, project financial risks may lead to financial risks, and then to macroeconomic risks. To this end, this study takes the commercial housing market as an example, based on the "stress test" method, to verify the following two scenarios of economic risk:

(1) Hypothesis scenario 1: In the future, 36 key monitoring cities will be affected by regulatory policies and house prices will stop rising. Does the current land price level pose a threat to the future profits of development enterprises?

(2) Hypothesis scenario 2: Under the current land price level, if the future housing price falls, how much will the decline threaten the profits of enterprises?

D. Data Sources

The data of land share of housing value, land prices and housing prices of Chinese cities are from China urban land price dynamic monitoring system. The historical data of land share of housing value in other countries in part III are from No Price Like Home: Global House Prices, 1870-2012 [10]. In part III, land share of housing value in the United States and Japan are derived from the Lincoln Institute of Land Policy | (average of 46 metropolitan areas) and the Japanese Institute of Land Research (average of Tokyo Metropolitan Area and

Osaka Metropolitan Area) respectively. The data of GDP per capita and urban population in the United States comes from the U.S. Bureau of Economic Analysis.

III. A COMPARISON OF LAND SHARE OF HOUSING VALUE BETWEEN CHINA AND FOREIGN COUNTRIES

A. Land share of housing value in China is at the Middle Level of that in Developed Countries in Similar Historical Stage

The indicators selected in this study include per capita GDP (calculated in current US dollars), urbanization rate and aging rate, reflecting three aspects of economy, urbanization and society respectively. The land share in China is the arithmetic average of 105 monitoring cities. From TABLE I, we can see that in the development stage close to China's current per capita GDP, land share of housing value in Japan is the highest,

reaching more than 80%, while that in Britain is the lowest (11%). Land share of housing value in China is relatively close to that in France, which is in the middle level of all the comparative countries. From the perspective of urbanization rate, in the period approaching China's current urbanization rate, Japan has the highest ratio of land price to house price (65% - 85%), Germany has the lowest ratio of land price to house price (57.2%), and China's ratio of land price to house price is still close to France at that time, which is in the middle level of comparative countries. From the point of view of the aging rate, in the period close to the aging rate in China, land share of housing value in Japan is the highest (81% - 90%). At present, land share in China is still in the middle level of the comparative countries. From the three perspectives of economy, urbanization and social development, China's current land share of housing value is at the middle level of that in developed countries in historical stage.

TABLE I. COMPARISON OF THE PRICE RATIO OF LAND PRICE IN THE APPROXIMATE DEVELOPMENT STAGE BETWEEN CHINA AND FOREIGN COUNTRIES

Country	Time	Per capita GDP	Land share (years in brackets)	Time	Urbanization rate	Land share	Time	Aging rate	Land share
China	2016	8123.18	32.15%	2016	57.35%	32.15%	2016	10.8%	32.15%
United States	1975	7820.07	19% (1970) 27% (1980)	1930	56.20%	20% (1930)	1977	10.9%	19% (1970) 27% (1980)
Germany	1977	7653.86	25% (1970)	1905	57.20%	18% (1900)			
France	1977	7513.34	30% (1970) 41% (1980)	1955	58.16%	32% (1950) 30% (1960)			
Japan	1978	8776.41	86% (1970) 81% (1980)	1955	58.42%	65% (1950) 85% (1960)	1985	10.3%	81% (1980) 90% (1990)
United Kingdom	1984	8179.19	11% (1980)						

B. The Changes in the Land share of China, the United States and Japan are Highly Correlated with the Economic Cycle.

From 2010 to 2016, land share of housing value in 36 key monitoring cities in China showed a trend of first falling and then rising, which basically coincided with the policy regulation cycle of China's real estate market. In 2010, housing prices and land prices in some cities in China rose too fast, and administrative measures with purchase restriction and loan restriction began to intervene in market, which led to a five-year strong regulation cycle of the real estate market in China. Due to the downward pressure on China's economy during the same period, the external environment for the development of the real estate market deteriorated, the willingness of developers to purchase land were lower than that in the previous period, causing the land share showed a slight decline trend. From 2015, with the gradual cancellation of purchase restriction, loan restriction, ease monetary policy and fiscal policy, the real estate market began to pick up, and land share of housing value stopped falling and rose. From 2010 to 2016, land share of housing value in 46 metropolitan areas of the United States showed a fluctuating upward trend, which basically synchronized with the gradual recovery of its economy from the financial crisis. After the crisis in 2008, the real estate market in the United States was hit hard, thus entering a difficult adjustment period of up to two years. After 2010, stimulated by "quantitative easing" and other policies, the U.S. economy gradually entered the recovery stage, while the recovery of the real estate market is relatively lagging behind. Although the imbalance between supply and demand

in the market, the high default rate and foreclosure rate of housing loans have eased, the rate of new housing starts is still hovering at a low level, and land share of housing value is at a historic low level. Since 2012, the U.S. real estate market has gradually resumed its activity, residential transaction volume and new start-up volume have begun to rise, market expectations have gradually improved, and the ratio of residential land price to house price has entered a fluctuating upward channel. After the real estate bubble burst in Japan in the 90s of last century, the land share of housing value continued to decline, but it began to pick up in 2005. However, in the wake of the global financial crisis in 2008, the recovery of the economy and the real estate market was slow, and the land share of housing value continued to decline. The change of land share in China, the United States and Japan is highly correlated with the economic cycle. Among them, China and the United States have more similarities in terms of numerical value and trend.

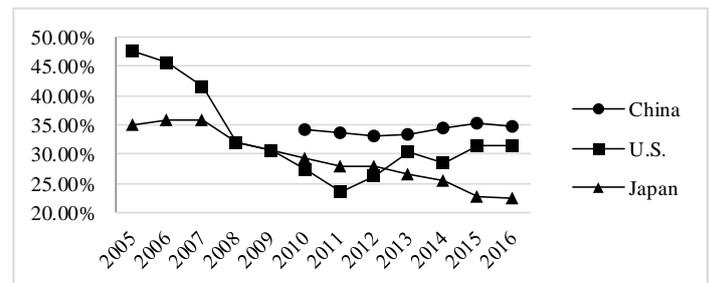


Fig. 1. Residential land share of housing value in China, the United States and Japan, 2005-2016

C. The Land share in China, US and Japan are Spatially Distributed According to the Development Level of Different Region

From 2012 to 2016, land share of housing value of residential land in China shows a ladder-like pattern, which is higher in the east, lower in the middle and west. In the economically developed and densely populated eastern region, land resources are relatively scarce and housing demand is large. Real estate enterprises have strong financial strength and high willingness to purchase land, which promotes the rapid rise of land prices, resulting in higher land prices than other cities. For example, land share of housing value in Xiamen reaches 65.30% in 2016, 47.54% in Shanghai and 46.96% in Hangzhou. The natural environment and livability of the central and western cities are relatively poor, the land supply is relatively large and the level of economic development is relatively low, coupled with a large number of population migration to the east, the degree of land market competition is lower than that of the eastern region. The spatial distribution of residential land share in the United States shows a pattern of

decreasing from east and west coasts to inland areas, which is similar to China's coastal-inland declining pattern and is consistent with the distribution of domestic economic development in the United States. In Seattle, San Francisco, Los Angeles and other high-income cities on the West Coast, the land share is at the highest level in the United States. For example, in 2016, Los Angeles was 70.71% and San Francisco was 80.89%. Some important cities on the east coast were also at a high level, such as Boston's land share of housing value of 60.20% in 2016, Miami's 53.59% and Washington's 46.51% [11]. Japan's land area is relatively narrow, and its population is highly concentrated in a few metropolitan areas. However, it can be seen that land share of housing value is also ladder-like distribution in metropolitan areas with different levels of economic development. Land share of housing value in different cities in China, the United States and Japan has a high similarity in spatial distribution, which is mainly related to natural resource conditions, economic development level, livability, public facilities and service quality, and cross-regional population mobility.

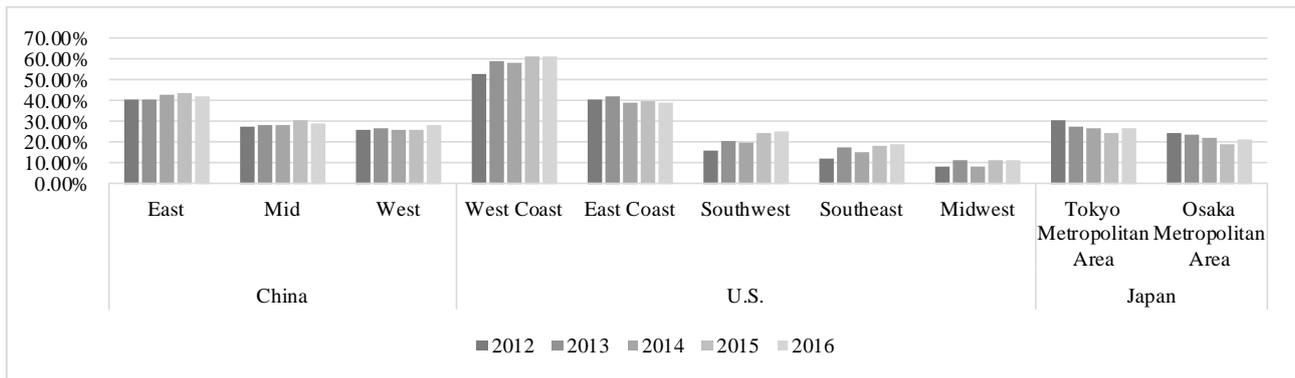


Fig. 2. Residential land share of housing value in China, the United States and Japan from 2012 to 2016

D. The Land Share in China and US are Positively Correlated with Urban Economy and Population Level

This paper chooses GDP per capita and population size to examine the relationship between the economic and social fundamentals and land share of housing value in large and medium-sized cities in China and the United States. From Fig. 3 and Fig. 4, it can be seen that land share of housing value in cities of China and the United States is positively correlated

with per capita GDP and population size. That is to say, in cities with high per capita GDP and large population size, land share is higher. This characteristic is also consistent with the regional distribution mentioned above. Most cities with high per capita GDP and large population in China are located in the eastern coastal areas, while those with high per capita GDP and large population in the United States are mainly located in the eastern and Western coasts.

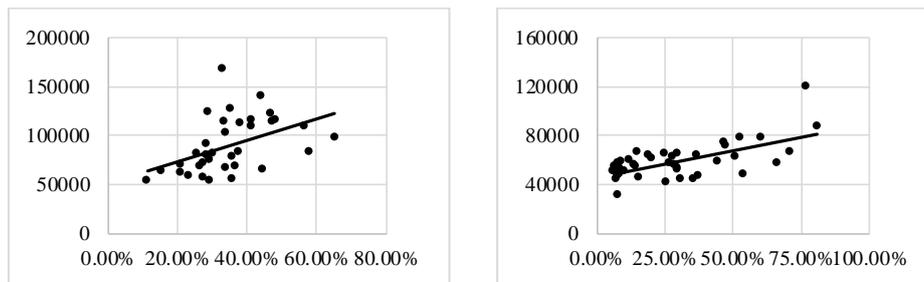


Fig. 3. A scatter plot of the relationship between the land share and per capita GDP in China (left) and the United States (right) in 2016

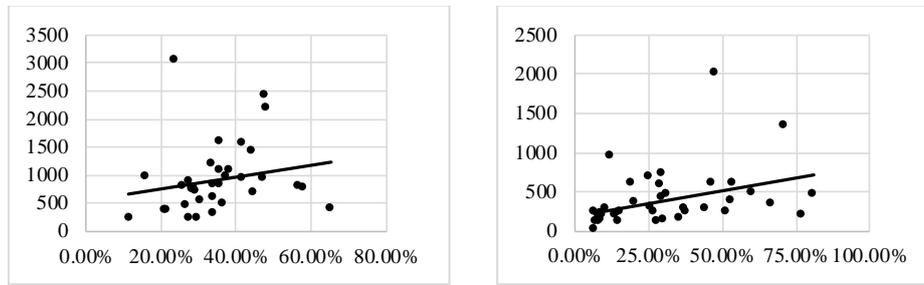


Fig. 4. Scatter plot of the relationship between land share and urban population size in China (left) and the United States (right) in 2016

Through international comparison from various perspective, it is found that land share of housing value in China is at the middle level of historical value in developed countries. The evolution trend, spatial distribution characteristic and the relationship with urban fundamentals in China are similar to those in developed countries, and generally meet the first two criteria of rationality.

IV. RISK ANALYSIS OF LAND SHARE OF HOUSING VALUE

A. Risk Degree under the Hypothesis of "Price of Future Almost unchanged"

According to our survey, the land cost usually accounts for about 60% of the total cost in a housing project (including construction and installation costs, period costs and tax fees) in China. Based on this, the total cost of the project is estimated to be land price/60%, and the period of the development is usually 1-2 years. in order to judge the risk under scenario 1, this paper first calculates the present value of future house prices according to formula (1), then calculates the profit of

projects that sell in 2018 and 2019 according to formula (2). P_p is the present value of housing prices, P_f is the housing prices in the future, i_{1-5} is one to five-year benchmark interest rate of loan, $Profit$ is profit margin per unit, and ATC is the total cost per unit of the project.

$$P_p = \frac{P_f}{(1+i_{1-5})^n} \tag{1}$$

$$Profit = P_p - ATC \tag{2}$$

The calculation results are shown in TABLE II. If housing development projects in different cities purchase land in 2017, after one to two years of development and sale period, even if the housing prices remain at the current level, there will still be an acceptable profit margin in most cities. But projects in in the Ningbo and Fuzhou may experience a small loss. Beijing, Shanghai, Shenzhen and other hot cities still have a large profit margin, which indicates that the risk of land share of housing value in most large and medium-sized cities in China is still controllable.

TABLE II. RISK ESTIMATION OF REAL ESTATE DEVELOPMENT PROJECTS IN DIFFERENT CITIES UNDER HYPOTHETICAL SCENARIO 1 AND HYPOTHETICAL SCENARIO 2

(Housing price unit: 10,000 Yuan/square meter building area)

City	2018 profit margin	2019 profit margin	Risk decline in 2018	City	2018 profit margin	2019 profit margin	Risk decline in 2018	City	2018 profit margin	2019 profit margin	Risk decline in 2018
Beijing	1.55	1.26	24.19%	Hangzhou	0.42	0.31	16.33%	Nanning	0.34	0.30	47.64%
Tianjin	0.44	0.38	31.52%	Ningbo	-0.02	-0.09	-1.55%	Chengdu	0.26	0.23	33.54%
Shijiazhuang	1.19	1.12	76.32%	Fuzhou	-0.02	-0.07	-1.66%	Guiyang	0.19	0.16	35.65%
Jinan	0.75	0.69	60.00%	Xiamen	1.30	1.15	40.08%	Kunming	0.18	0.14	22.20%
Qingdao	0.61	0.52	30.14%	Guangzhou	0.45	0.26	10.91%	Xi'an	0.33	0.30	48.60%
Zhengzhou	0.17	0.15	31.87%	Shenzhen	2.56	2.30	43.81%	Taiyuan	0.34	0.31	50.28%
Shenyang	0.30	0.27	43.92%	Haikou	0.38	0.35	50.82%	Hohehot	0.19	0.17	36.56%
Dalian	0.38	0.34	38.74%	Hefei	0.46	0.42	54.45%	Lanzhou	0.53	0.49	63.32%
Changchun	0.30	0.27	48.49%	Nanchang	0.45	0.40	46.88%	Xining	0.40	0.38	79.80%
Harbin	0.49	0.46	72.60%	Wuhan	0.33	0.28	32.44%	Yinchuan	0.23	0.21	51.58%
Shanghai	0.86	0.61	15.50%	Changsha	0.36	0.32	47.88%	Urumchi	0.40	0.37	63.07%
Nanjing	0.79	0.69	36.35%	Chongqing	0.47	0.44	63.80%	Lhasa	0.41	0.37	50.25%

$$P_{2018} = ATC * (1 + i_{1-5}) \tag{3}$$

$$RD = \frac{P_{2018} - P_{2017}}{P_{2017}} \tag{4}$$

B. Risk Tolerance under the Hypothesis of "Future House Prices May Decline"

In order to judge the risk under hypothesis scenario 2, we first calculate the house price when the real estate project just realizes the break-even in the future according to formula (3), and then calculate the decline of housing prices that could cause financial risk according to formula (4). P_{2018} is break-even housing price in 2018, P_{2017} is housing price in 2017, ATC is the total cost per unit of the project, i_{1-5} is one to five-year benchmark interest rate of loan, RD is the decline of housing price that could cause financial risk.

As can be seen from TABLE II, under the current land price level, if projects in 36 key monitoring cities happen to achieve break-even situation in 2018, housing prices in most cities need to fall by 20%-70% from the current level. Considering the current economic and social development trend and the operating conditions of the real estate market, it is not realistic for such a large drop in urban housing prices in the short term. However, Ningbo and Fuzhou need a small increase in housing prices to achieve a break-even situation, which

means that the current land price-housing ratio is too high (the calculation is only an estimate of the overall risk level and specific development projects need to be specifically analyzed). In addition, Guangzhou, Hangzhou and Shanghai can bear a smaller decline in housing prices, and its risks are also worth vigilance.

In summary, even if housing prices stop rising in the next two years, most of the 36 key monitoring cities do not have obvious economic risks with the current land share of housing value. Judging from the overall situation of land share of housing value of urban commercial housing in China, 31.18% of the average land share of 105 monitoring cities in 2017 can be taken as the lower limit of reasonable interval. The upper limit of reasonable interval is 57.91%, which is the average land share in Fuzhou and Ningbo. Below the lower limit of the interval, the city's land market is relatively cold, the local government faces a certain risk of land returns, while above the upper limit of the interval, the city's commercial residential projects may have financial risks and economic risks under the background of strict regulation and control of the real estate market in the future.

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

On the basis of defining the rationality of land share of housing value, this paper draws the following conclusions by comparing the historical value, trend and distribution characteristic between China and foreign countries and analyzing possible economic risk: firstly, China's current land share of housing value is at the middle level of that in many developed countries at similar development stages. The changing trend of land share of housing value in China and major developed countries is closely linked with the economic cycle and the real estate market cycle. The spatial distribution is ladder-like according to the difference of regional economic and social development level, and is positively correlated with the level of urban economic development and population size. Secondly, from the perspective of financial risk of real estate development enterprises, under the circumstances of stable macroeconomic fundamentals, stable social operation and stable market control policies, the land cost pressures of real estate development in most large and medium-sized cities in China are generally controllable, and there is no possibility of causing widespread economic risks. In other words, China's average land share is reasonable. However, the land share of a few cities is too high and worthy of vigilance. Judging from the overall situation of land share of housing value in China, the reasonable range of land share is approximately 31.18%~57.91%.

This study has certain policy guiding significance for the regulation of land market and the establishment of long-term mechanism of real estate market. Land departments should improve the accuracy of residential land supply and dynamically adjust land supply plans according to the land market conditions in different cities. In hot cities with high land share of housing value, the supply of residential land should be increased. In cities with scarce land resources and difficulty of increasing land supply, the utilization efficiency of existing land should be improved through urban renewal, and land share of housing value should be controlled at a reasonable level from the perspective of preventing economic risks. In cities where land share of housing value is too low, land supply should be reduced to prevent extensive development and waste of resources.

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