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Article

The Characteristics of the Housing Market and the Goal of Stable and Healthy Development in China's Cities

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Abstract: This paper constructs a mathematical model to study China's urban real estate markets, in which there are different types of demands from house buyers, and housing suppliers adopt the strategy of quality differentiation second-degree price discrimination. Our theoretical result shows that, in China's case, without government intervention in the housing market, it is almost inevitable that the prices of both housing and the related resources will rocket. To achieve the goal of "houses built for inhabitation", we put forward a policy scheme to achieve "houses built for inhabitation" in China's cities from the perspectives of "speculation limitation" and "price control". We also conduct a numerical analysis to consider the macroeconomic effects of these two policy solutions on the housing market, and we conclude that Chinese authorities should introduce a resale tax in the housing market and learn from Singapore's experience in housing market regulation.

Keywords: residential demand; speculative demand; quality differentiation; pro-rich; pro-poor



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1. Introduction

Since the reform and opening up, the housing system has abolished welfare housing, the market-oriented reform of China's cities and towns has been basically completed, and real estate has entered the fast lane of development. Subsequently, the market has gradually matured through two financial crises and many rounds of policy regulation and cleansing. Figure 1 summarizes the commercial housing sales area, commercial housing sales and development investment in real estate development from 1998 to 2020. Compared to 1998, the domestic commercial housing sales area has increased about 15 times to reach 1.79 billion square meters, in 2021, commercial housing sales have increased 90 times to reach 18.2 trillion yuan, in 2021, and real estate development investment has increased nearly 25 times to reach 14.8 trillion yuan, in 2021. During the period of 1998 to the present, China's real estate market has gone through three clearly characterized development phases, including the rapid development phase, the boom phase, and the adjustment and maintenance of stability phase.

The first phase was from 1998 to 2008. After the "housing reform" in 1998, the operating environment of the real estate market was improved, housing demand exploded centrally, the sales area of commercial houses grew rapidly, and the house price index climbed rapidly from 2001. After a smooth transition, real estate enterprises entered the era of rapid capitalization, and personal housing credit developed rapidly. As a result, the government introduced corresponding policies to adjust housing prices, such as "eight real estate market regulation measures" and a policy of guaranteed housing.

The second phase was from 2009 to 2013. After the financial crisis in 2008, the government launched a stimulus plan and an easy monetary environment, which led to the rapid activation of domestic real estate investment and prosperity. In major Chinese cities, such as Beijing, Shanghai, and Shenzhen, house prices have approached Western levels (D. Zhang et al. 2017). Government regulation and control policies were intensively introduced, and the game with the market became more frequent. The urban pattern of the real

estate market has also changed significantly, and the real estate market in many small and medium-sized cities has achieved rapid development during this period.



Figure 1. National real estate development trends 1998–2021. Data source: National Bureau of Statistics; CREIS CMI.

The third phase is from 2014 to the present. This phase can also be called the de-stocking and high market size consolidation phase. After the rapid expansion of the previous period, the national commercial housing construction area of 11.3 billion square meters in the period 2008–2014, the sales area totaled 7.4 billion square meters during the same period based on Figure 1. From this set of data, it is easy to find that the real estate market has a huge backlog of inventory, the market supply and demand structure has changed, real estate enterprises promote capital recovery by reducing prices because of their tightening funds, and the price of housing appears to be trending down. At the same time, the market differentiation of different cities is obvious, the supply of houses in first-tier and hot second-tier cities still exceeds demand, and house prices remains high, while the situation in third- and fourth-tier cities is quite the opposite (Y. Huang 2020). After 2014, the real estate market showed a rapid rise in quantity and price in 2016 with the implementation of the “de-stocking” policy and the large-scale squatter policy. Therefore, the central government re-emphasized that “houses are for living, not for speculation” to maintain stability, making it clear that housing construction must return to the purpose of living. The long-term mechanism is also accelerating, and the real estate market is performing more steadily, with the sales area of commercial properties nationwide stabilizing at around 1.7 billion square meters in Figure 1. In summary, the overall trend of China’s real estate market development over the past two decades has shown a cycle pattern of rise-fall-rise, from the previous period of rapid expansion into a period of stable development. Such a trend is closely related to the intervention of various government policies. Whenever there is excessive volume and price growth in the real estate market, it is often accompanied by various types of stringent regulation and control policies, and when the real estate market is in the doldrums, the policies will also be relaxed.

However, demand for houses is more complicated than demand for ordinary consumer goods, because houses have a dual nature consisting of consumption demand and investment demand. In China’s urban real estate market, it is easy to have an excessive “speculation room” phenomenon (J. Chen et al. 2017). Looking back on the development of China’s urban housing market in the past 20 years, one of its characteristics is the rapid rise in housing prices (Kuang and Li 2012), and there are obvious signs of hyperinflation. According to statistics from the National Bureau of Statistics, the average sale price of residential housing increased by approximately 232% from 2000 to 2015, and the sale price rise in the major cities is closer to 400%. Another feature of China’s real estate market is that the inhabitation demand, the investment demand, and speculative demand have become completely imbalanced, with the speculative demand becoming dominant (Yang et al. 2014). A high percentage of house buyers buy houses neither for dwelling nor for investment,

but for reselling them to make a huge profit from the rapid rising prices. In general, the housing market in Chinese cities can be explained by an upward spiral: expectations of high housing prices have led to higher demand for sales, while higher demand has further led to higher housing prices. Is there a bubble at the high price level? The existence of bubbles in the real estate market has been extensively researched by foreign scholars (e.g., [Evans 1989](#); [Stiglitz 1990](#); [Topol 1991](#); [Cuñado et al. 2005](#)) and empirically verified by quantifying house price bubbles (e.g., [Abraham and Hendershott 1994](#); [Sornette 2008](#); [Mikhed and Zemčik 2009](#); [Ahuja et al. 2010](#); [Bangura and Lee 2022](#)). Although China's real estate market started later than Western countries, due to its rapid development, more and more scholars in China have focused on the existence of house price bubbles in China based on the studies of foreign scholars (e.g., [Hui and Yue 2006](#); [Gao et al. 2014](#); [W. Zhang 2017](#)) and have used the indicator method ([H. Liu and Shen 2004](#)), modeling method ([J. Lv 2010](#)) and other methods to measure the house price bubble to affirm the existence of house price bubbles in China. Therefore, the issue of how to ensure that "the houses are built to be inhabited but not for speculation" is extremely important.

Based on the above observations, we conduct a micro-economics analysis of China's urban housing market and make policy suggestions to the Chinese authorities. The rest of the paper is organized as follows. Section 2 provides a literature review of the relevant topics and describes the motivation of our paper. Section 3 constructs the market demand model of real estate based on the Cobb–Douglas production function, and distinguishes the price discrimination of the housing market supply on the condition of complete and incomplete information. In Section 4, we point out the alienation of dwelling demand and speculative demand, the single housing supply mode, and the danger of the bubble bursting in the Chinese urban housing market. In Section 5 we put forward a policy scheme to achieve "houses built for inhabitance" in China's cities from the perspectives of "speculation limitation" and "price control". In Section 6, we apply numerical analysis to consider the macroeconomic effects of these two policy solutions on the housing market and offer reference for the healthy development of the housing market in China's cities. Section 7 concludes the paper by discussing the implications of our findings.

2. Literature Review and Motivation of Our Paper

Marx's demand theory ([Marx and Engels 1958](#)) holds that housing, as a natural demand and survival need, is not only one of the most basic human needs but is also the basis of other needs. While residential prices are important information reflecting the residential development, the importance of residential issues and the sensitivity of residential prices have attracted extensive attention from a large number of scholars and the public. A review of the existing literature at home and abroad reveals that economic fundamentals including population, income, interest rate, inflation rate, financial system, and land policy can better explain housing price changes. [Mankiw and Weil \(1989\)](#), [Stuart et al. \(1999\)](#); [Saiz \(2007\)](#); [Lu et al. \(2014\)](#); [X. Liu et al. \(2016\)](#) analyze the impact on housing prices in terms of birth rate, migration, and urban migration, and population growth tends to be positively correlated with housing price growth. [Case and Shiller \(1990\)](#); [Otto \(2007\)](#), [Y. Zhang et al. \(2011\)](#); [S. Zhang and Fan \(2015\)](#) find that both domestic and foreign real income have a significant effect on housing prices. [Brueggeman et al. \(1984\)](#); [Kostas and Zhu \(2004\)](#); [F. Lv \(2016\)](#) point out that the effect of real estate price fluctuations on inflation is positive. In addition to the analysis of housing prices with individual factors, as research continues, more and more studies have included some or all of the above-mentioned macroeconomic factors in a framework for comprehensive research and analysis; for example, [Pagés and Maza \(2003\)](#); [Kostas and Zhu \(2004\)](#) combined income, population, interest rate and inflation rate to analyze their effects on housing prices, respectively.

Not only do population, income, interest rates, and inflation rates have significant effects on housing prices, but financial systems and land policies are also critical to housing price effects. By constructing a commodity hierarchy model, [Sweeney \(1974\)](#) shows that although the government cannot control rental prices by providing subsidies to devel-

opers, it can lower rents by increasing public housing construction programs. Based on Sweeney's model, [Ohls \(1975\)](#) developed a general equilibrium housing market filtering model considering the formulation of housing policies for the low-income class. Their study shows that direct monetary subsidies for housing for low-income households are more efficient in terms of government costs than building subsidized housing. [Galster \(1997\)](#) further extends Ohls' argument by stating that when housing supply is sufficient and housing demand is sufficiently elastic, "capitation subsidies" are better than "brick subsidies" because "capitation subsidies" are more effective in transferring policy benefits to low-income and moderate-income households. [O'Sullivan \(2000\)](#) argues that the in-kind housing security approach is an effective way to quickly alleviate the housing hardship of low-income groups in a housing supply shortage, although it may lead to inefficiencies. In addition, [Gyourko and Linneman \(1989\)](#) explore the effectiveness of rent pricing and related government regulations in solving housing problems. Their study shows that "rent control" policies have led to greater heterogeneity in the distribution of welfare among different income groups, with low-income households generally more able to benefit from these policies at the expense of landlords. This may lead landlords to reduce funding for housing maintenance, which can ultimately affect housing quality. [Disney \(2007\)](#) further builds on [Gyourko and Linneman's \(1990\)](#) argument that the implementation of a "national paid rental incentive program" can not only meet the housing needs of low-income groups, but also meet landlords' higher rental return requirements.

Based on a qualitative analysis of the impact of financial systems and land policies on housing prices, in recent years, [Iacoviello \(2005\)](#); [Iacoviello and Neri \(2010\)](#) applied the theory of dynamic stochastic general equilibrium (DSGE) to an analysis of the housing market, and they developed a four-sector DSGE model consisting of representative families, intermediate production enterprises, final product manufacturers, and the government. This is a pioneering quantitative study, laying down a solid theoretical and empirical analysis foundation for people to evaluate the impacts of the government's financial and monetary policy on housing prices. Following Iacoviello and Neri's DSGE approach, [Valentin \(2014\)](#) ran a Bayesian estimation of a DSGE model, finding that the government's monetary policy affected the housing price through the transmission effect of the nominal interest rate; he also found that the strength of monetary policy and the ratio of housing loan amount to housing value were positively correlated. On the other hand, [Kannan et al. \(2012\)](#) used a DSGE model to study the effect of macro-prudential policies on economic stability against the background of rising housing prices. His simulation results show that these policies would be able to hedge the financial risks and stabilize the economy when the economy faces either financial sector or housing demand shocks. In addition, [Carstensen et al. \(2009\)](#), using data from 12 European countries during the period 1995–2006, applied a panel vector auto-regression (VAR) model to explore the importance of the heterogeneity of the housing loan market on monetary policy transmission. He divided 12 European countries into two separate groups according to the sizes of the impacts of monetary policy shocks on real house prices; his results show that the effect of monetary policy on macroeconomic fluctuations has been magnified in countries where real house prices are more reactive. [Gupta et al. \(2010\)](#) used a large data set from South Africa for the first quarter of 1980 to the fourth quarter of 2006, employing the factor extension VAR model to measure the effects of monetary policy on the growth of real estate prices; the results, based on the impulse response function, show that, in general, money supply shocks have positive impacts on housing prices, although there is significant heterogeneity in the impacts upon different types of housing.

Based on this, many Chinese scholars have conducted a series of studies on housing prices and housing bubbles from a perspective of monetary policy, fiscal policy, and land policy in the context of the rapid growth of housing prices, the dominance of speculative demand, and the existence of housing bubbles in the Chinese real estate market. However, most of these studies are empirical. [Liang and Gao \(2007\)](#) made use of the 1999–2006 panel data from China's 28 provinces and autonomous regions, applying an error correction

model to discuss regional differences in the effects of monetary policy on housing prices. They found that the credit quota has greater effects on both the short-term fluctuation of housing prices and their long-term trend in China's east and west regional areas than it has in China's central area. Additionally, there is no significant difference in the effects of the real interest rate on housing prices in the eastern, central, and western regions, and the impacts are small. Based on Liang and Gao's research, [Dai and Zhang \(2009\)](#) used a structural VAR model to analyze the monetary policy transmission mechanism of real estate prices in China, and they found that monetary policy has a smooth transmission path to real estate prices, whereas the transmission path from real estate prices to housing consumption and investment is usually jammed. This shows that in urban areas in China, the transmission of monetary policy to housing consumption and investment is not smooth, and it is likely to lead to real estate market risk aggregation. [Huo \(2013\)](#), [Dreger and Zhang \(2013\)](#) also argued that the low interest rate policy introduced by the government has greatly boosted real estate investment and massive credit expansion, while the excess capital gathered in the real estate market will further lead to the creation of a market bubble. Then, [D. Zhang et al. \(2017\)](#) used time series of house prices and rents for 33 cities and argued that bubbles exist in the housing markets of most of the Chinese sample cities and also argued that irrational expectations may play an important role in generating these bubbles by taking into account deterministic time trends with breakpoints in a unit root test of the house price-to-rent ratio. Although these bubbles can be largely mitigated by strong government intervention, government policies should be formulated differently from city to city because of their variability. [Kuang \(2005\)](#) and [Zheng and Shi \(2011\)](#), respectively, studied China's housing market by analyzing the data of real estate sale price indices and residential land price indices in the first quarters of 1999 through 2005, and the data in China's 35 large and medium-sized cities; these researchers concluded that "land finance (finance by selling land)", as the local government's policy, is the main reason for the rapid rise of real estate prices in China. Further, [X. Wang and Yang \(2012\)](#) constructed a real estate market equilibrium model under the land supply restriction; their research shows that "land finance" has led local governments to rely increasingly heavily on the real estate markets. Additionally, the local governments all have an incentive to create various policies to support high housing prices, eventually encouraging speculative behaviors in the property market and pushing up the housing prices. Through international comparison and analysis, [X. Wang and Yang](#) also found that China's real estate speculation is significantly more dependent on the land finance than that of the other developed countries. A study by [S. Huang et al. \(2012\)](#), based on an empirical test of the "tax substitution" mechanism by using the survey data of industrial enterprises in China from 1998 to 2008, reveals the reasons why local governments are keen to promote the development of real estate. [S. Guo \(2016\)](#) and [C. Guo and Wang \(2018\)](#) argued that the aggressive monetary policy and land finance adopted by the state can also increase the extent of real estate bubbles except for the presence of faster urbanization and the influence of expanding speculative demand.

In addition, some scholars have analyzed the impact of the "deleveraging" policy on housing prices and housing bubbles. The government's determination to reduce the indebtedness of the real estate market and force capital out of the real estate industry is reflected in the "three deleveraging policies" and the "three red lines" policy in 2021. In order to achieve the goal of the "de-stocking" of real estate, the government stimulated the demand for housing through various preferential policies for housing purchases, which made the loans for housing purchases rise rapidly. As home purchase loans account for the majority of the residential sector's debt, "de-stocking" has led to a further increase in residential sector leverage and a new round of house price increases. At present, China's residential sector leverage is already high, and excessive residential sector leverage can trigger the risk of a real estate bubble ([Li and Zhao 2019](#)). By constructing a dynamic general equilibrium model containing high leverage characteristics, [R. Liu et al. \(2018\)](#) also emphasized that China should make efforts to control the trend of excessively high residential sector leverage in recent years and keep the residential sector leverage stable

in the process of promoting structural deleveraging. Later, [Lin et al. \(2021\)](#) theoretically analyzed the pricing relationship between asset price bubbles and financial leverage and found that under the premise of positive default probability, the rise in financial leverage leads to an increase in positive asset price bubbles. The NARDL model is also used to empirically analyze the long- and short-term asymmetric effects of subsectoral macro-leverage on China's real estate price bubbles. The empirical results show that the negative adjustment of leverage in both the real economy and the financial sector will effectively suppress the continuous expansion of real estate price bubbles in the long run, but the "one-size-fits-all" counter-cyclical leverage adjustment is not conducive to the long-term stable operation of the real estate market, so a differentiated leverage regulation policy should be implemented. Based on this, [F. Zhang et al. \(2022\)](#) developed a DSGE model to investigate how monetary policy and macroprudential policy can coordinate to cope with the real estate market bubble and ensure the stable development of the real economy in the context of high corporate leverage. The study finds that although rising leverage can promote the growth of consumption, investment and output, it also brings deflation and rising housing prices, which are not conducive to the healthy development of the real economy in the long run. Therefore, when promoting economic deleveraging, the macro-prudential policy of using macro-leverage to peg house prices should be withdrawn in a timely manner, together with the price-based monetary policy of pegging inflation and house prices to achieve the purpose of promoting real economy investment and output growth while steadily reducing the real estate bubble.

Finally, since the air pollution problem is one of the common concerns of all human beings, more and more scholars at home and abroad have started to analyze its impact on the real estate market from the perspective of air quality prices. Based on the HPM model implementation that includes consumer theory ([Lancaster 1966](#)) and implicit market theory ([Rosen 1974](#)) to quantify air quality, some scholars ([Chasco and Gallo 2013](#); [S. Chen and Jin 2019](#)) analyze the relationship between it and air quality from the housing sales market, stating that air quality data have a significant negative correlation with house prices. A small number of other scholars have focused on the rental market, such as [Hitaj et al. \(2018\)](#), who analyzed exploring the responses of renters to air quality. Based on the study by [Hitaj et al.](#), [R. Liu et al. \(2018\)](#) analyze which market is more affected by air quality by comparing the housing sales market and the rental market, using Chengdu as an example. Later, [J. Wang and Lee \(2021\)](#) build on previous studies to include consumer preferences for air quality in both markets and combine panel data from 283 Chinese prefecture-level cities to provide a more comprehensive understanding of residents' preferences for air quality, noting that both the housing sales market and the rental market have a negative relationship with air quality, and that cleaner air can bring benefits to all residents, differences in air quality preferences across city tiers may be determined by local air quality conditions and socioeconomic status.

To sum up, the existing studies have, to some extent, provided a good analysis of the connection between economic fundamentals and the performance of the housing market, especially the relationship between government's housing policy and housing market performance ([Ye and Wu 2008](#); [Chiu 2008](#)). Their empirical results suggest that any improvement of fiscal and monetary policies could restrict speculative behavior in the real estate markets, stabilizing housing prices and leading to a more efficient allocation of national resources.

Our study contributes to the existing literature in the following aspects. First, this study constructs a mathematical model to study China's urban real estate markets, in which there are different types of demands from house buyers and housing suppliers adopt the strategy of quality differentiation second-degree price discrimination. Previous literature regarding the China's housing market is generally either quantitative analysis or case study; few published studies have provided a theoretical analysis of China's housing market from the demand side and supply side. Second, this study introduces a policy scheme to achieve "houses built for inhabitance" in China's cities from the perspectives

of “speculation limitation” and “price control”. We also conduct a numerical analysis to consider the macroeconomic effects of these two policy solutions on the housing market. Such findings help to enrich the literature of both housing market regulation specifically, and housing market in general.

3. The Demands and Supplies in the Real Property Market

3.1. Demand for Real Estate Properties

In this section, we try to model the demand for real estate properties. We may assume that a family with income (and wealth) I will spend its income for food, clothing, housing (for dwelling or for speculation purpose), and travelling. Suppose its utility function is given by the Cobb–Douglas form:

$$u = \prod_{i=1}^4 q_i^{\alpha_i} \tag{1}$$

where q_i represents the quality of food, quality of clothing, quality of housing, and quality of transportation/travelling, respectively, and the α_i are the elasticity of substitution; $i = 1, 2, 3, 4$. Suppose that the prices of the qualities food, etc., are, respectively, represented by $P_i, i = 1, 2, 3, 4$. Then, the decision problem of the family is:

$$\begin{aligned} \max u &= \prod_{i=1}^4 q_i^{\alpha_i} \\ \text{ST. } \sum_{i=1}^4 P_i q_i &= I \end{aligned} \tag{2}$$

It is straightforward to show that the optimal decision of the family is:

$$q_i^* = \frac{\alpha_i I}{P_i} \tag{3}$$

As a result, we obtain:

Lemma 1. *The higher the income (wealth) of a family, the higher its demand for quality of housing.*

The implication of Lemma 1 is that, for any apartment of the same quality, a richer family has a higher evaluation than does a poorer family. In fact, the conclusion of Lemma 1 remains true if we agree that housing is a *normal good*; this will be assumed throughout the discussions in this paper.

3.2. Complete Information and Zero-Consumer Surplus Pricing

The real estate market is not a competitive market. Each of the suppliers (real estate developers) has a very high monopoly power in his local community area. (e.g., Li Ka-Sing in Hong Kong). As a result, a real property developer does not have a “supply curve”, instead, he/she prices his/her products according to the demand curve.

In the case of complete information, or in the case of all potential buyers having the same demand, a real property developer, as the monopolist, can choose first-degree price discrimination, exploiting the entire consumer surplus from each of the customers. This is one of the reasons for the hyperinflation in the real property market of HK and the substantial supernormal profit for Cheung Kong Property Holdings. This kind of zero-consumer surplus pricing can be interpreted by the graph in Figure 2.

Note that the vertical axis measures the buyer’s willingness to pay for marginal quality—we may also refer to it as the “price”. The horizontal axis represents the quality of the house that the buyer wants to buy. For convenience, we assume that the total cost of building either a house or an apartment is proportional to its quality (including its size, built-in facilities, etc.) and, thus, the average cost per unit of quality is constant, as is the marginal cost. We only sketch the upper part of the demand curve above the supplier’s marginal cost line. In the case when a buyer’s surplus is completely exploited by the developer, the producer surplus is exactly equal to the area of the triangle ABO , and the

real price of an apartment equals the variable costs of construction plus the area of the triangle ABO .

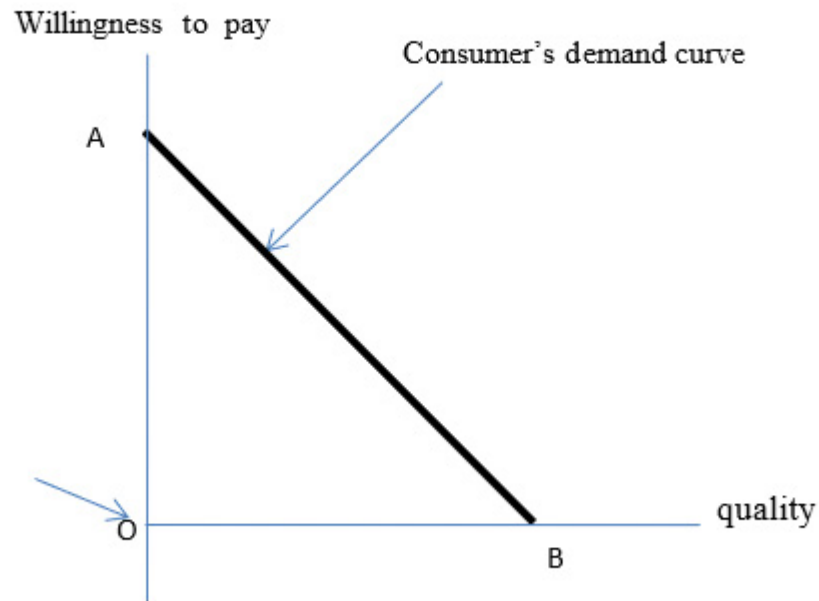


Figure 2. Zero-consumer surplus pricing in the case of complete information.

3.3. Incomplete Information and Second-Degree Price Discrimination

In the case of incomplete information, where the real estate developer does not know the buyer's exact demands, the real estate developer can introduce second-degree price discrimination. To explain this concept, assume that there are two different types of potential buyers in the real estate market demanding different qualities of houses, as is shown in Figure 3 below.¹

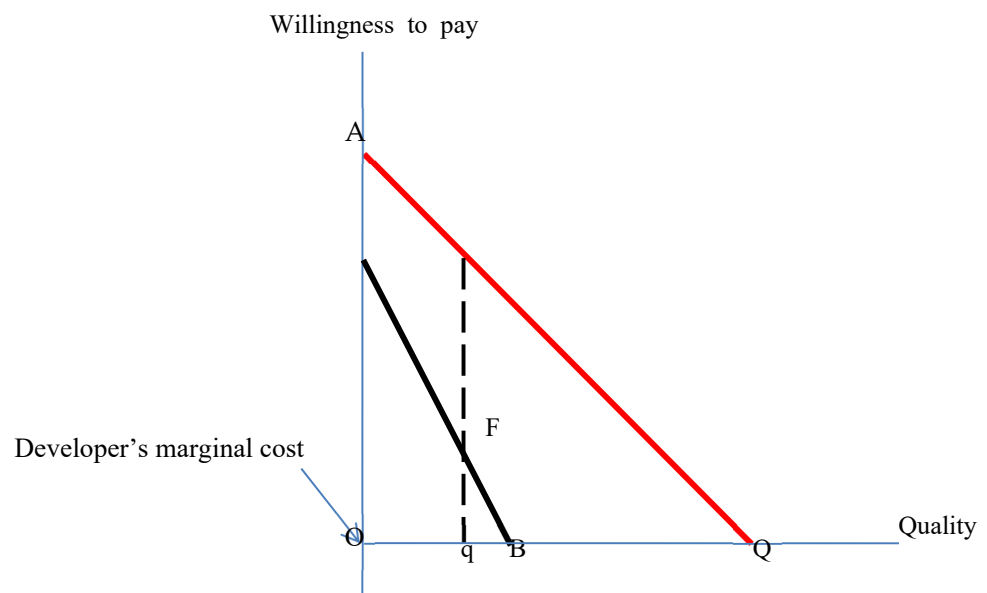


Figure 3. Second-degree price discrimination on the premise of incomplete information.

Suppose the developer knows these two different types of demand but cannot identify the type of each customer. Then, he/she could design the products as follows. In Figure 3, suppose the supplier chooses q as the quality of the houses or apartments for the lower-end buyers. To exploit all the buyers' surplus, he/she will charge a payment equal to the area of

the quadrilateral $AOqF$ plus the variable cost $q \cdot MC$, with the area of the quadrilateral $AOqF$ as the producer surplus. Note that a richer buyer might choose to buy this lower quality apartment (from which he/she can get a consumer surplus equal to the quadrilateral $AFEC$), unless he/she can guarantee at least the same surplus from buying a higher-quality house. As a result, the developer can, at most, exploit a producer surplus equal to the area of the triangle OQC , subtracting the area of the quadrilateral $AFEC$ from selling a higher-quality apartment to a richer buyer. As a result, when there are n_H richer buyers and n_L poorer buyers in the market, the total producer surplus the developer can exploit equals:

$$P.S.(q) = n_H(\text{area of triangle } OQC) - n_H(\text{area of quadrilateral } AFEC) + n_L(\text{area of quadrilateral } AOqF) \tag{4}$$

To find the optimal q -value, computing the differential of $P.S.(q)$:

$$dP.S.(q) = -n_H \cdot |FE| \cdot dq + n_L \cdot |qF| \cdot dq \tag{5}$$

When $n_H \cdot |FE| = n_L \cdot |qF|$, it holds that $dP.S.(q) = 0$, and $P.S.(q)$ is maximized.

From the graph, we also know that, in the case of incomplete information; the quality of the low-end apartments is lower than the quality that the low-end customers desire. The fact that the “cheaper” apartments in Hong Kong have very limited space (less than 30 square meters) can be well justified by this second price discrimination mechanism.

4. The Demands for Real Properties in the Chinese Market

4.1. Characteristics of China’s Real Property Markets in Large Cities

At an early stage of the property market, even in large cities, both low-end apartments and high-end ones are available. As can be observed, the prices of land grow, as do the prices of construction materials and the labor costs. As a result, the variable costs of low-end apartments will rocket, and the quality of equilibrium demanded for low-end apartments will shrink.² At some point, the developer will discover that profit is maximized by constructing only high-end apartments, and the low-end market will disappear. (Refer to Figure 4 below).

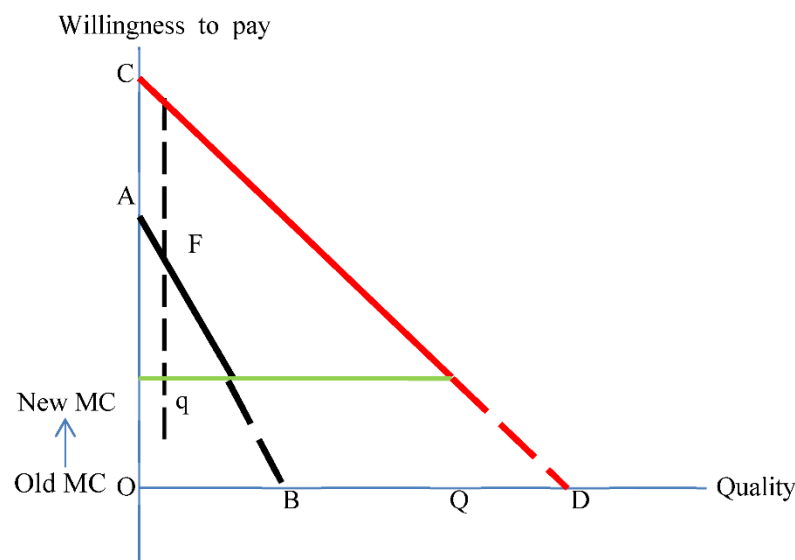


Figure 4. China’s real property markets.

4.2. Dwelling Demand versus Speculative Demand

As time passes, demands for high-end apartments for speculation purposes increase. We try to analyze the effects of the growing speculative demand. Suppose that the apartments are of the same level of quality. The demand curve AB in the graph is dwelling

demand, and the demand curve *CD* is the speculation demand, as shown in Figure 5 below. The developer will now charge a price equal to the area of the triangle *COD*. The speculators will buy the apartments with a zero surplus at the current stage, because they expect the real price to grow at the next stage, enabling them to earn a real profit in the future. This process continues repeatedly as far as in any stage the speculators expect the apartment price will grow. This has been the dominant patterns in China’s real estate markets in the large cities, where the dwelling demands are almost completely neglected.

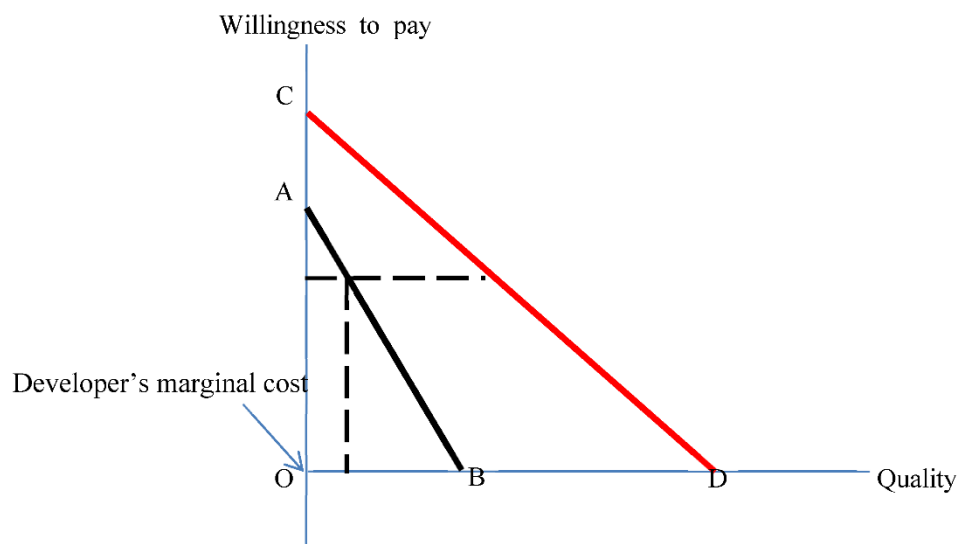


Figure 5. Dwelling demand (*AB*) and speculative demand (*CD*).

4.3. The Danger of Bubble Burst

As mentioned in the last subsection, the speculative market can remain active, and the prices of apartments can keep growing only when the current buyer expects the inflation rate of the real property prices always to be higher than the Consumer Price Index (CPI) of the economy. This situation cannot be sustained forever as, otherwise, increasing percentages of national income and wealth will be expended on real estate speculation. Another consequence of a long-term evolution of real estate speculation is that the speculators (the rich) become increasingly rich, and those who cannot afford to speculate become increasingly poor. In the last 20 years, because the authorities made no real efforts to intervene in the real estate markets, occasionally even introducing measures to promote real estate speculation, some serious structural problems have emerged in China’s economy. In fact, on the one hand, more economic resources were “invested” in the real estate markets, while, on the other hand, many of the ordinary families living in large cities could not afford good quality dwelling, and a very high percentage of the newly built apartments remain in the inventory stocks. As mentioned by the media, in many suburbs of large cities, many “haunted towns” without inhabitants have already emerged. These are places where most of the newly built apartments have not been sold, and those that have been “already sold” are not occupied by any residents.

With all the problems we have mentioned, the real estate speculation bubbles will inevitably burst eventually. For those responsible policy makers, the question that must be answered is what policies should be introduced to reduce the negative impacts on both the economy and society.

5. Policy Suggestion

As analyzed in the last section, the main problem in China’s real estate markets is caused by a lack of speculation control. As speculative behavior becomes increasingly dominant in the real estate market in large cities, the developers (supported by local governments) expend more economic resources on real property speculation without

giving back any real returns to society. The misallocation of economic resources is an important cause of China’s economy slowing down over the last few years.

In terms of macroeconomic theory, to ensure China’s economic growth and economic development and create harmony in Chinese society, responsible policy makers must introduce effective measures to restrict speculative behavior in the real property markets.

5.1. Restriction on Speculation

As mentioned above, the speculation activity in the real estate markets is rooted in the expectation of rocketing prices leading to great profit from reselling. When the prices are under a degree of control, the expectation for high profit from reselling will no longer be realistic, and the speculative behavior will be under control. As a result, buying an apartment, whether high end or low end, will be primarily for dwelling.

We now revisit the case of second-degree price discrimination, but with government policy implementation added.

There are several available options from which the policy maker can choose. No matter which option is chosen, it must be implemented with taxation upon reselling. For simplicity, we assume that the taxation policy means that the reseller makes zero profit, and, therefore, buying for dwelling purposes dominates in the real property market.

Option 1. *No other intervention other than the reselling tax.*

In this case, the government imposes a higher amount of reselling-tax, i.e., $T = P_0 \times [(1 + IR - CPI)^k - 1]$, for real estate so that speculators cannot make excessive profits. The market is very much the same as in Section 3.3. The developers offer different quality apartments to meet the different types of demand. As shown in the graph below, lower-end customers will purchase lower-end apartments for dwelling, paying a price equal to the area of the quadrilateral $AOqF$, enjoying zero economic surplus; higher-end customers will purchase higher-end apartments for dwelling, paying a price equal to the sum of the area of the quadrilateral $AOqF$ and that of the triangle EqQ , enjoying an economic surplus equal to the area of the quadrilateral $CAFE$. (Refer to Figure 3 above).

From the graph, one can check that the pricing is consistent with the self-selection criterion: by buying the higher-end apartments, the high-end customers do not enjoy less of an economic surplus than they would if they bought the lower-end apartments.

That the decision of the developer is profit-maximized can be verified by the marginal condition, as explained below. Imagine that the developer, instead of building the lower-end apartments with a quality of q , builds these apartments with quality $q+dq$. Then, his additional surplus becomes:

$$n_L \cdot |Fq|dq - n_H \cdot |EF|dq \tag{6}$$

This equals to zero if and only if the producer surplus is maximized.

5.2. Price Control

We assume that the government can distinguish a poorer buyer from a richer one through knowledge of their family income (and wealth). There will be an available option from which the policy maker can choose, ensuring that the goal that “houses are built to be inhabited” can be reached.

Option 2. *The government builds the lower-end houses, either selling or renting to the poorer with subsidies (S), and leaves the supply of higher-end houses to the developers in the private sector, while charging selling taxes, i.e., $T' = \min\{P' - TC, n_L \times S/n_H\}$.*

In this option, the government builds the lower-end apartments according to the low-income buyer’s demand for quality (as represented by $|OB|$ in the graph) and sells at a price just equal to the building costs, leaving the supply of high-end apartments to the private developers. As is shown in Figure 6, a government supplier develops apartments

with a quality equal to that at point C, selling them at a price equal to the building costs $MC \cdot |OC|$, leaving the low-income buyer with an economic surplus equal to the triangle OAC. A private sector developer develops apartments with a quality equal to that at point C', charging a price equal to the triangle A'O'C' plus the building costs $MC \cdot |O'C'|$, leaving no surplus at all to the buyer. In addition, in the case in which the government notices that the quality of the low-end apartments is too low compared to the high-end ones, the government could build higher quality apartments for those poorer families by charging a price below the building costs (subsidizing the poorer) while levying a specific tax upon the private developer. We will explain this option in more detail in Section 6.

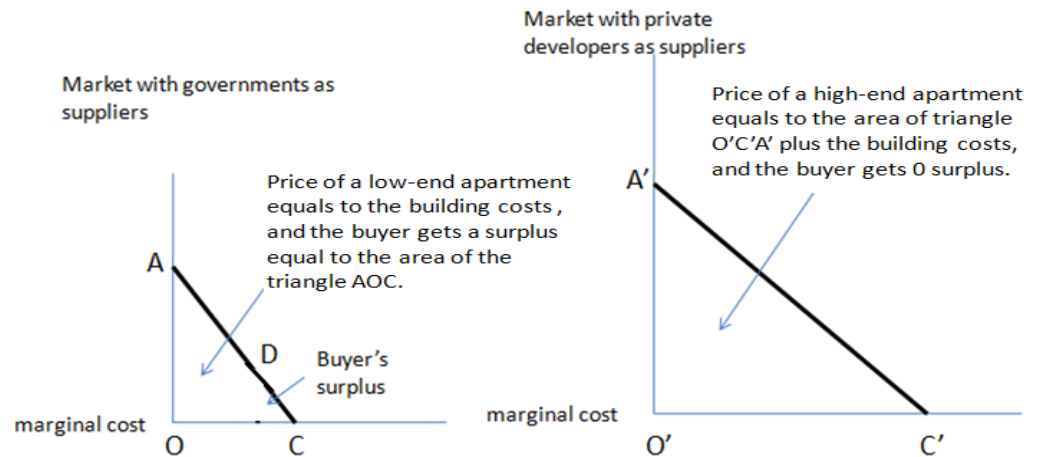


Figure 6. The effects of option 2.

5.3. A Comparison between the Two Options

It is clear that option 1 is more favorable to those who can afford higher-end apartments, because they enjoy a positive economic surplus; at the same time, the lower-end apartment buyers have zero surpluses, and, usually, the apartments they can purchase do not meet the quality that they demanded. Therefore, we may refer to this option as *pro-rich*, as is the case in the real estate markets in Hong Kong that we already mentioned.

Option 2, on the other hand, is based on a *pro-poor* policy. In this option, higher-end apartment buyers end up with zero surpluses, yet lower-end buyers can buy an apartment that satisfies their demand for quality. Furthermore, those with incomes below the threshold can enjoy government subsidies. This is the situation, to some extent, in Singapore. Actually, most of the lower-income families own their apartments, of which the quality and space are comparable, if not better than, those owned by the middle-income class in Hong Kong.

6. A Numerical Analysis

To explain the above-mentioned two schemes, we consider a simple example in this section. Let us assume that there are two types of house buyers, the poorer and the richer, and their demands for housing quality are given by the demand equations below:

$$AB : y - MC = 1000 - 1.25Q \tag{7}$$

$$A'B' : y - MC = 1600 - 0.8Q \tag{8}$$

Here, the variable y represents the “price of quality” marked up above the supplier’s marginal cost. Assume that a speculator expects the annual inflation rate in the housing market to be $\pi = 10\%$, and the consumer price index to be $CPI = 105\%$. So, as mentioned above, in the absence of government intervention, the property speculation market will dominate, and the low-end housing market will eventually collapse.

If the government levies a resale tax in the high-end housing market, any seller who sells their own high-end housing after the K -year purchase must pay a tax that is equivalent to the following fees:

$$T = P_0 * [(1 + \pi - CPI)^k - 1] \tag{9}$$

Therefore, in this case, all speculators will find that speculation on real estate will not generate excess profits. In turn, the housing speculation will be well limited, which could ensure that “houses are built to be inhabited but not for speculation”.

Suppose the demand side of the real estate market consists of 300 low-end buyers and 100 high-end buyers. In option 1, note that the quality for a high-end apartment or house is 2000, and the important step is to compute the quality q of apartments designed by the developer. With the help of Figure 5, we can compute:

$$\begin{aligned} qF &= 1000 - 1.25q, FE = 600 + 0.45q \\ 300(1000 - 1.25q) &= 100(600 + 0.45q) \\ q &= 571.4 \\ qF &= 285.75, FE = 857.13 \end{aligned} \tag{10}$$

Let us also assume the $MC = 1000$ in this example. Thus, we can calculate that the price for a low-end apartment (the area of quadrilateral $OqFA$ plus the developer’s costs) is USD $367,339 + USD 571.4*(1000) = USD 938,739$, and that the price for a high-end apartment (the area of the triangle OQC minus the area of the quadrilateral $AFEC$ plus developer’s costs) is USD $1,183,698 + USD 2000*(1000) = USD 3,183,698$.

In option 2, as the private sector’s real estate developer is the sole seller of high-end housing, he/she will charge a price equal to the area of the triangle $A'O'C'$ plus the costs, thereby exploiting the full economic surplus. The sale price of high-end apartments is $0.5*(2000)*(1600) + 2000*(1000) = USD 3,600,000$.

On the other hand, the government supplier builds low-end apartments with a quality equal to 800, selling to the poorer buyers at a price equal to a building cost of $800*(\$1000) = USD 800,000$.

Suppose that the government regards the low-end apartment quality of 800 is too low compared with the high-end apartment quality of 2000; if so, the government may, for example, build low-end apartments of quality 1200 but sell to the poorer family at a price of USD 800,000. As a result, the total subsidy given up in the low-end market is $300 * (1200 - 800) * (USD 1000) = USD 120,000,000$. At the same time, the government can levy a specific tax upon the private developer, which equals to USD 1,200,000. As a result, the actual price received by the private developer for a high-end apartment is USD 2,400,000. Please note that, this actual price is still higher than the developer’s building cost of USD 2,000,000, leaving a net profit of USD 400,000 to him/her from each of the high-end apartments sold.

A comparison of two options shows that in option 2, poorer low-end housing consumers will pay lower prices for better quality housing, while the quality of the housing available to wealthier high-end housing consumers will not be reduced (although no surplus is left to them). Thus, for society, option 2 leads to better distribution of social welfare than does option 1. As mentioned above, we may call option 1 a pro-rich option, and option 2 a pro-poor option.

7. Conclusions and Discussion

The main findings of this paper are that the real property developer, as the monopolist, can choose first-degree price discrimination in the case of complete information, or, in the case of all potential buyers having the same demand, exploit the entire consumer surplus from each of his/her customers. Meanwhile, on the premise of incomplete information, where the real estate developer does not know the exact demands of a buyer, the real estate developer can introduce second-degree price discrimination. As shown in the results of the supply for real properties in the Chinese market, at some early stage, even in large cities, both low-end and high-end houses are available; however, as observed, the land

prices grow, as do the prices of construction materials and labor costs. As a result, the variable costs of low-end houses will also rocket, and the equilibrium quality demanded for low-end houses will shrink; at some point, the developer will discover that profit is maximized by constructing only high-end houses, and the low-end market will disappear.

Furthermore, we present evidence that, for the same quality of housing, richer families may have a higher rating than poor families and be willing to pay higher prices. As illustrated by the results of characteristics of the demands for real properties in the Chinese market, as time passes, demands for high-end houses for speculation purposes increase; the speculators will buy the house with a zero surplus at the current stage because they expect the real price to grow at the next stage, and they will then earn a real profit in the future. This process continues repeatedly for any stage in which the speculators expect that the house price will grow; these have been the dominant patterns in China's real estate markets in the large cities, where the dwelling demands are almost completely neglected.

It is also demonstrated in this paper that the speculative market can remain active and the prices of houses can keep growing only when the current buyer expects the inflation rate of the real property price to be always higher than the CPI of the economy; this situation cannot be sustained forever because otherwise increasing percentages of national income and wealth will be expended in real estate speculation; another consequence of a long-term evolution of real estate speculation is that the speculators (the rich) become increasingly rich, and those who cannot afford to speculate become increasingly poor.

Last but not least, we emphasize that regulations such as resale tax and other measures of speculation restriction must be introduced in the housing market to redirect the housing market back to "building houses mainly for dwelling purposes". We also suggest that the Chinese authorities should learn from Singapore's experience in regulating the urban housing market so that most ordinary families can afford better quality housing.

In this paper, there are still some limitations that can be improved in future research. We mainly use numerical simulations to examine the impact of speculation restriction and price control schemes on housing market supply and demand, assuming that other influencing factors remain unchanged. It is difficult to test this empirically using market data, as subsidies for low-end housing and charging selling taxes for high-end housing (price control) and resale taxes (speculation restriction) have not yet been extended to relevant cities in China. We will continue to monitor the introduction of relevant policies and conduct further studies in the future.

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Notes

¹ The idea in our analysis is similar to that in Hal Varian's research paper "versioning of information goods".

² The demand curve for the high-end house or apartment is shifted outward, and the equilibrium quality demanded might or might not change.

References

- Abraham, Jesse M., and Patric H. Hendershott. 1994. Bubbles in Metropolitan Housing Markets. *National Bureau of Economic Research* 104: 50–72.
- Ahuja, Ashvin, Lillian Cheung, Gaofeng Han, Nathan Porter, and Wenlang Zhang. 2010. Are House Prices Rising Too Fast in China? *Social Science Electronic Publishing* 36: 45–66.
- Bangura, Mustpha, and Chyi Lin Lee. 2022. Housing price bubbles in Greater Sydney: Evidence from a submarket analysis. *Housing Studies* 37: 143–78. [CrossRef]
- Brueggeman, William B., Andrew H. Chen, and Thomas G. Thibodeau. 1984. Real Estate Investment Funds: Performance and Portfolio Consideration. *AREUEA Journal* 12: 333–54. [CrossRef]
- Carstensen, Kai, Oliver Hülsewig, and Timo Wollmershaeuser. 2009. *Monetary Policy Transmission and House Prices: European Cross-Country Evidence*. Ifo Institute of Munich: CESifo Working Paper Series NO: 2750. Available online: <https://ssrn.com/abstract=1447256> (accessed on 31 July 2022). [CrossRef]
- Case, Karl E., and Robert J. Shiller. 1990. Forecasting Prices and Excess Returns in the Housing Market. *Real Estate Economics* 18: 253–73. [CrossRef]
- Chasco, Coro, and Julie Le Gallo. 2013. The impact of objective and subjective measures of air quality and noise on house prices: A multilevel approach for downtown madrid. *Economic Geography* 89: 127–48. [CrossRef]
- Chen, Jie, Lingzhen Yao, and Hongwei Wang. 2017. Development of public housing in post-reform china. *China & World Economy* 25: 60–77.
- Chen, Shiyi, and Hao Jin. 2019. Pricing for the clean air: Evidence from Chinese housing market. *Journal of Cleaner Production* 206: 297–306. [CrossRef]
- Chiu, Rebecca L. H. 2008. Government intervention in housing: Convergence and divergence of the Asian dragons. *Urban Policy & Research* 26: 249–69.
- Cuñado, Juncal, Luis Alberiko Gil-Alana, and F. Perez de Gracia. 2005. A test for rational bubbles in the NASDAQ stock index: A fractionally integrated approach. *Journal of Banking & Finance* 29: 263–354.
- Dai, Guoqiang, and Jianhua Zhang. 2009. A study on monetary policy transmission mechanism based on the real estate price. *Finance & Trade Economics* 21: 31–37.
- Disney, Julian. 2007. *Affordable Housing in Australia: Some Key Problems and Priorities for Action*. Melbourne: National Forum on Affordable Housing.
- Dreger, Christian, and Yanqun Zhang. 2013. Is there a bubble in the Chinese housing market? *Urban Policy and Research* 31: 27–39. [CrossRef]
- Evans, George W. 1989. The fragility of sunspots and bubbles. *Journal of Monetary Economics* 23: 297–317. [CrossRef]
- Galster, George. 1997. Comparing demand-side and supply-side housing policies: Sub-market and spatial perspectives. *Housing Studies* 12: 561–77. [CrossRef]
- Gao, Bo, Huilong Wang, and Weijun Li. 2014. Expectations, speculation and housing price bubbles in Chinese cities. *Financial Research* 2: 44–58.
- Guo, Ce, and Wenmei Wang. 2018. Causes of China's real estate bubble and management countermeasures. *The Economist* 6: 40–41.
- Guo, Shifu. 2016. The impact of monetary policy and fiscal policy on real estate price bubbles. *Journal of Northeast University of Finance and Economics* 6: 36–42.
- Gupta, Rangan, Marius Jurgilas, and Alain Kabundi. 2010. The effect of monetary policy on real house price growth in south Africa: A factor-augmented vector autoregression (favar) approach. *Economic Modelling* 27: 315–23. [CrossRef]
- Gyourko, Joseph, and Peter Linneman. 1989. Equity and efficiency aspects of rent control: An empirical study of New York City. *Journal of Urban Economics* 26: 54–74. [CrossRef]
- Gyourko, Joseph, and Peter Linneman. 1990. Rent controls and rental housing quality: A note on the effects of New York City's old controls. *Journal of Urban Economics* 27: 398–409. [CrossRef]
- Hitaj, Claudia, Lori Lynch, Kenneth E. McConnell, and Constant I. Tra. 2018. The value of ozone air quality improvements to renters: Evidence from apartment building transactions in Los Angeles County. *Ecological Economics* 146: 706–21. [CrossRef]
- Huang, Shaoan, Binkai Chen, and Zitong Liu. 2012. Rent-tax substitution, fiscal revenue and government real estate development strategy. *Economic Research Journal* 35: 93–106.
- Huang, Yu. 2020. Changes in China's real estate market through the years and trend outlook. *China Real Estate* 29: 21–26.
- Hui, Eddie, and Shen Yue. 2006. Housing price bubbles in Hong Kong, Beijing and Shanghai: A comparative study. *Journal of Real Estate Finance and Economics* 33: 299–327. [CrossRef]
- Huo, Zhao. 2013. The relationship between real estate investment bubbles and macroeconomic variables. *Technology Economics and Management Research* 6: 77–83.
- Iacoviello, Matteo. 2005. House prices, borrowing constraints, and monetary policy in the business cycle. *American Economic Review* 95: 739–64. [CrossRef]
- Iacoviello, Matteo, and Stefano Neri. 2010. Housing market spillovers: Evidence from an estimated DSGE model. *American Economic Journal: Macroeconomics* 2: 125–64. [CrossRef]
- Kannan, Prakash, Pau Rabanal, and Alasdair M. Scott. 2012. Monetary and macroprudential policy rules in a model with house price booms. *The BE Journal of Macroeconomics* 12: 544–53. [CrossRef]

- Kostas, Tsatsaronis, and Haibin Zhu. 2004. What drives housing price dynamics: Cross-country evidence. *BIS Quarterly Review* 5: 65–78.
- Kuang, Weida. 2005. A Study on the relationship between housing pricing and land pricing: Basic model and evidence from China. *Finance & Trade Economics* 21: 56–63.
- Kuang, Weida, and Tao Li. 2012. Land sale pattern, land sale and real estate price. *Journal of Financial Research* 12: 56–69.
- Lancaster, Kelvin J. 1966. A new approach to consumer theory. *Journal of Political Economy* 74: 132–57. [CrossRef]
- Li, Cheng, and Yi Jie Zhao. 2019. A study on the impact of financialization of real enterprises on micro leverage and financial risk. *Financial Regulation Research* 10: 20–38.
- Liang, Yunfang, and Tiemei Gao. 2007. Empirical analysis on real estate price fluctuation in different provinces of China. *Economic Research Journal* 8: 133–42.
- Lin, Sihan, Shoudong Chen, and Yan Wang. 2021. A study on the asymmetric dynamic impact of macro leverage on real estate price bubbles in China. *Financial Review* 5: 91–105.
- Liu, Hongyu, and Yue Shen. 2004. Economic analysis of the law of real estate price change. *Construction Economics* 9: 43–47.
- Liu, Runqiu, Chao Yu, Canmian Liu, Jian Jiang, and Jing Xu. 2018. Impacts of Haze on Housing Prices: An Empirical Analysis Based on Data from Chengdu (China). *International Journal of Environmental Research and Public Health* 15: 1161. [CrossRef]
- Liu, Xueliang, Jing Wu, and Yongheng Deng. 2016. Population Surge, Marriage and Housing Market. *Nankai Economic Research* 1: 58–76.
- Lu, Ming, Haijun Ou, and Binkai Chen. 2014. Rationality or Bubble: An Empirical Study of Urbanization, Migration and Housing Prices. *World Economy* 1: 30–54.
- Lv, Fengyong. 2016. Study on the inflationary effect of real estate price fluctuations. *Price Theory and Practice* 12: 28–32.
- Lv, Jianglin. 2010. Measurement of bubble level in China's urban housing market. *Economic Research* 6: 28–41.
- Mankiw, N. Gregory, and David N. Weil. 1989. The Baby Boom, the Baby Bust, and the Housing Market. *Regional Science and Urban Economics* 19: 235–58. [CrossRef]
- Marx, Karl, and Frederick Engels. 1958. *Complete Works of Marx and Engels*. Beijing: People's Publishing House. (In Chinese)
- Mikhed, Vyacheslav, and Petr Zemčik. 2009. Do House Prices Reflect Fundamentals? Aggregate and Panel Data Evidence. *Journal of Housing Economics* 18: 140–49. [CrossRef]
- O'Sullivan, Arthur. 2000. *Urban Economics*. Boston: Irwin/McGraw-Hill.
- Ohls, James C. 1975. Public policy toward low income housing and filtering in housing markets. *Journal of Urban Economics* 2: 144–71. [CrossRef]
- Otto, Glenn. 2007. The Growth of House Prices in Australian Capital Cities: What do Economic Fundamentals Explain? *Australian Economic Review* 40: 225–38. [CrossRef]
- Pagés, Jorge Martínez, and Luis Angel Maza. 2003. Analysis of House Prices in Spain. Available online: <http://www.bde.es/f/webbde/SES/Secciones/Publicaciones/InformesBoletinesRevistas/BoletinEconomico/03/Files/be0310e-art3.pdf> (accessed on 31 July 2022).
- Rosen, Sherwin. 1974. Hedonic prices and implicit markets: Product differentiation in pure competition. *Journal of Political Economy* 82: 34–55. [CrossRef]
- Saiz, Albert. 2007. Immigration and Housing Rents in American Cities. *Journal of Urban Economics* 61: 345–71. [CrossRef]
- Sornette, Didier. 2008. A case study of speculative financial bubbles in the South African stock market 2003–2006. *Physica A: Statistical Mechanics and Its Applications* 388: 869–80.
- Stiglitz, Joseph E. 1990. Symposium on bubbles. *The Journal of Economic Perspectives* 4: 13–18. [CrossRef]
- Stuart, A. Gabriel, Joe P. Matthey, and William L. Wascher. 1999. House price differentials and dynamics: Evidence from the Los Angeles and San Francisco Metropolitan areas. *Economic Review-Federal Reserve Bank of San Francisco*, 3–22.
- Sweeney, James L. 1974. A commodity hierarchy House Price Differentials and Dynamics Evidence from the Los Angeles and San Francisco Metropolitan Areas model of the rental housing market. *Journal of Urban Economics* 1: 288–323. [CrossRef]
- Topol, Richard. 1991. Bubbles and volatility of stock prices: Effect of mimetic contagion. *The Economic Journal* 101: 786–800. [CrossRef]
- Walentin, Karl. 2014. Housing collateral and the monetary transmission mechanism. *Scandinavian Journal of Economics* 116: 635–68. [CrossRef]
- Wang, Jianing, and Chyi Lin Lee. 2021. The value of air quality in housing markets: A comparative study of housing sale and rental markets in China. *Energy Policy* 160: 112601. [CrossRef]
- Wang, Xuelong, and Wen Yang. 2012. China's land finance and house price fluctuation: An international comparative analysis. *Economic Review* 12: 88–96.
- Yang, Zan, Huan Zhang, and Jie Chen. 2014. How do potential motivations of re-purchasing houses affect the housing wealth? A micro Study based on urban household survey data. *Journal of Finance and Economics* 40: 54–64.
- Ye, Jianping, and Zhenghong Wu. 2008. Urban housing policy in china in the macro-regulation period 2004–2007. *Urban Policy & Research* 26: 283–95.
- Zhang, Dayong, Ziyin Liu, Gangzhi Fan, and Nicholas Horsewood. 2017. Price bubbles and policy interventions in the Chinese housing market. *Journal of Housing and the Built Environment* 32: 133–55. [CrossRef]
- Zhang, Feiyan, Chao Yang, and Wentao Zhang. 2022. High leverage, real estate bubble and macro control. *Southern Finance* 9: 1–19.

-
- Zhang, Suodi, and Xinying Fan. 2015. A Study on the Influence of Income and Interest Rate on House Price Based on Panel Quantile Regression Model. *Mathematical Statistics and Management* 6: 57–65.
- Zhang, Wei. 2017. Expectations, monetary policy and real estate bubble: An empirical verification of the international real estate market. *Journal of the Central University of Finance and Economics of Plants* 8: 77–90.
- Zhang, Yali, Yunfang Liang, and Tiemei Gao. 2011. Expected income, yield and house price volatility—A study based on a dynamic panel model in 35 cities. *Finance and Trade Economics* 1: 122–29.
- Zheng, Siqi, and Zhan Shi. 2011. The land and housing market under “land finance”: An analysis of local government behavior. *Social Sciences in Guangdong* 2: 5–10.