ISSN: 1648-715X / eISSN: 1648-9179

VILNIUS TECH
Vilnius Gediminas Technical University

INTERNATIONAL JOURNAL OF STRATEGIC PROPERTY MANAGEMENT

2025
Volume 29
Issue 2
Pages 114–127
https://doi.org/10.3846/ijspm.2025.24036

IMPACT OF FINANCIAL MARKET DEVELOPMENT ON HOUSING PRICES: EVIDENCE FROM CHINA

Wencheng ZHANG, Tajul Ariffin MASRON *

School of Management, Universiti Sains Malaysia, Penang, Malaysia

Article History:
- received 24 August 2024
- accepted 28 March 2025

Abstract. Housing prices in cities of China had soared by 70% from 2012 to 2021, attracting increasing public concern. Financial market development may suppress housing prices by allowing speculators to channel capital into financial markets rather than merely into the property sector, whereby it plays a critical role in shaping housing prices theoretically. This study aims to investigate the impact of financial market development on housing prices with a sample of 261 cities in China from 2011 to 2021, concluding that financial market development is negatively related to housing prices based on the GMM model. Correspondingly, a potential policy to decrease housing prices is to promote financial market development.

Keywords: housing prices, financial market development, Entropy method, GMM model, China.

*Corresponding author. E-mail: *tams@usm.my*

1. Introduction

The development of the real estate has fueled the growth of the construction and related industries, providing a huge power to investment, employment, and infrastructure development in China and an important source of government revenue. According to China National Bureau of Statistics, the added value of real estate and related industries accounted for around 14 percent of China's GDP in 2022. Reasonably priced real estate not just stimulates consumption and drives the development of associated industries such as construction, decoration, and home appliances, contributing to overall economic growth (Goodhart & Hofmann, 2000), but also helps attract more talents and investors to a city, enhances a city's competitiveness, and dramatically improves the quality of life of residents.

Since the housing system reform in 1998, China's urban housing market has gone through a golden period of rapid development. During this period, commodity housing prices in China continued to rise by 414%. As presented in Figure 1, the housing prices to income ratio for New York, London, and Tokyo city centers in 2022 were 12, 18, and 12, respectively. Comparatively, the ratio of housing prices to income for Beijing, Shanghai, Guangzhou, and Shenzhen in China were 55, 46, 35, and 32, respectively during the same period. The rental return rates for New York, London, and Tokyo were 2.5%, 2.5%, and 2.1%, while those for Beijing, Shanghai, Guangzhou, and Shenzhen were 1.5%, 1.8%, 1.3%, and 1.0%, which indicates housing prices in China still rank the top compared to other countries. China' cities account for half of the top ten cities in terms of housing prices across the globe, and accordingly a range of problems have been resulted by extremely high housing prices.

The leverage ratio of enterprises and residents continues to rise, increasing the possibility of financial crisis. In 2022, the balance of real estate loans was 7.9 trillion US dollars accounting for 43.9% of GDP, and the balance of personal housing loans was 5.77 trillion US dollars accounting for 32.1% of GDP (People's Bank of China, 2024). The exposition of various crises has a common theme: excessive borrowing and sustained debt accumulation that is a precursor to financial crises (Reinhart & Rogoff, 2009). Unlike credit expansion providing funding for productive investments, credit expansion driven by rising housing prices significantly increases the risk of financial crisis (Jordà et al., 2015; Richter et al., 2021). Also, rising housing prices hinder residential consumption (Chen & Gao, 2012) and impede the development of the manufacturing industry. Rapid and continuous rise in housing prices will increase the cost of living, thus leading to a crowding-out effect on consumption as a result (Fratantoni & Schuh, 2003; Cristini & Sevilla, 2014; Aladangady, 2017). Another critical point that cannot be ignored is that excessive rise in housing prices has led to excessive investment in the real estate industry and misallocation of resources, severely squeezed investment in the real economy, and inhibited the development of high-tech industries in the manufacturing sectors, with a high possibility of resulting in hollowing out effect for the manufacturing industry (Bleck & Liu, 2018).

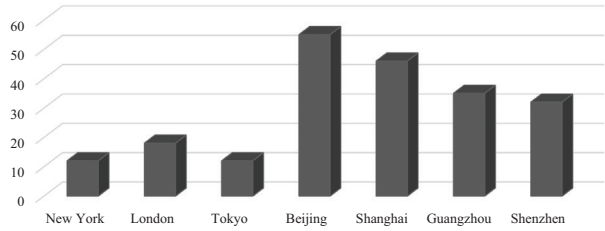


Figure 1. Ratio of housing prices to income across cities globally in 2022 (source: Numbeo, 2022)[1]

The policy that needs to be immediately put into effect is to promote financial market development aimed at inhibiting the rise in housing prices. Financial market development plays a unique role in the effective allocation of capital and the optimization of resources (King & Levine, 1993; Rousseau & Wachtel, 2011), facilitates the financing procedure, and provides real estate developers with low-cost financing tools. Thereby, they can quickly obtain the funds at a low cost through a variety of financial instruments to support the housing supply. Huge amounts of money have been issued by China government into the economic system, but due to the under-developed financial market development, most of the liquidity, which is supposed to support the economic development especially the manufacturing industry, now floods into the real estate industry. Well-developed financial market development is characterized by a wide diversification of financial products, enabling speculators to manage their wealth effectively (Rousseau & Wachtel, 2011), diversify financial risks and safeguard the stability of residents' lives (Beck et al., 2000). Thus, a well-functioning financial market can serve as a reservoir and an effective alternative for speculating in real estate sector. Specifically, financial market development encourages individuals and organizations to divert their speculative funds flowing into the financial market from the real estate sector, reducing the financial attributes of the real estate and effectively alleviating the problem of the rapid increase in housing prices.

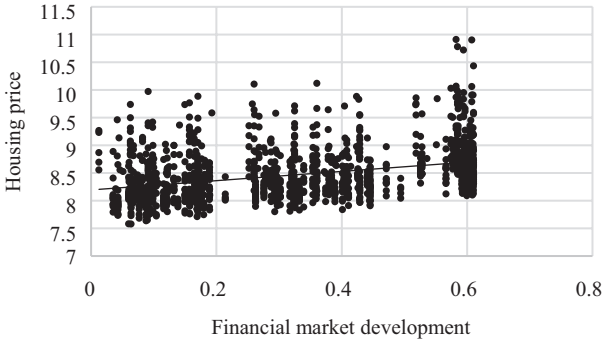
To further find support, Figure 2 provides preliminary supporting evidence for the impact of financial market development on housing prices. As indicated in Figure 2a and Figure 2b, the full sample including 261 cities in China is split into two sub-samples based on the median level of financial market development, one with high financial market development and the other with low financial market development. The simple correlations indicated in Figure 2 suggest that when financial market development level is at low, roughly between 0 and 0.6 financial market development could not prohibit housing prices from increasing. Nonetheless, when financial market development levels are above 0.6, the figures show a flatter correlation. This flatter correlation hints the potential housing-price-dampening role of financial market development in China, which means that financial market development does play a role in moderating rising housing prices.

However, China is a vast country with hundreds of cities varying in economic dynamism, population size, public services etc. Therefore, to more accurately capture the role of financial market development on housing prices in different categories of cities, it is necessary to stratify the cities into different classifications like first-tier, second-tier and third-tier cities based on China City Business Attractiveness Ranking (2024) based on Wong and Lin (2024). Also, in each classification the sub-sample is split into two parts based on the median level of financial market development. In terms of second-tier and third-tier cities, when financial market development level is higher, the correlations are flatter, suggesting financial market development plays a dampening role in shaping housing prices. Intriguingly, when it comes to the first-tier cities, the case is opposite. Accordingly, it preliminarily implies that the role of financial market development in housing prices behavior differs due to the specific dynamics of cities in China.

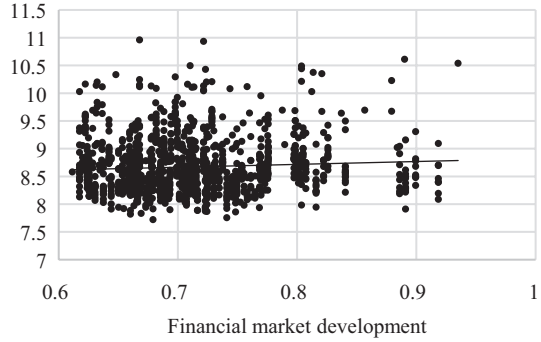
More importantly, as a core benefit of financial market development, efficient capital allocation ensures that resources are directed towards not only the financial market but also some other most productive fields like manufacturing sector rather than merely being concentrated in overheated real estate market. This shift offers a sustainable pathway to address housing affordability challenges and supports balanced economic development as well. So, there are some obvious advantages for financial market development in curbing rising housing prices compared to some other solutions, such as housing "purchase restriction" policy, affordable housing project, real estate tax, an increase in the downpayment ratio, and an increment in lending interest rate. These regulations have been in place for years, but it appears there is little effect and have caused various adverse side effects or losses, such as resource allocation inefficiency, corruption, and rent-seeking. This study provides a new insight into mitigating rising housing prices from the perspective of financial market development. The level of financial market development is significantly lower than that in the USA indicated in Figure 3 manifesting the financial market development in China is underdeveloped.

Developing countries like China has been facing potential challenges in boosting economic development, increasing the income and enhancing the welfare, which is usually accompanied by rising housing prices if the real estate sector cannot be appropriately regulated. Housing, as one of the basic needs of people's lives, is an important part of safeguarding the well-being of citizens. Therefore, high housing prices adversely affect housing affordability, and thus impedes residents' welfare, which is opposite to the original aim to boost economic development and cannot be accepted. Then, the significance of this study is clear. It is important to encourage implementing policies

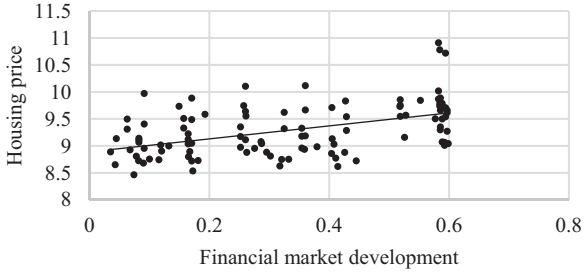
[1] Numbeo is a collection of web pages containing numerical and other itemizable data about cities and countries. It provides current and timely information on world living conditions, including the cost of living, housing indicators, health care, traffic, crime, and pollution.



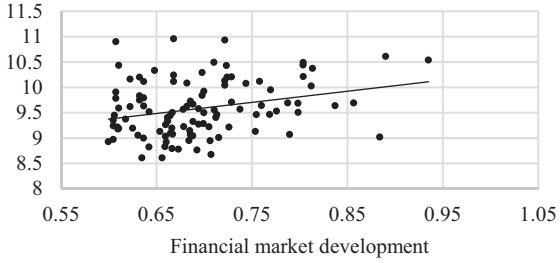
a) Low level of financial market development vs Housing prices in full sample



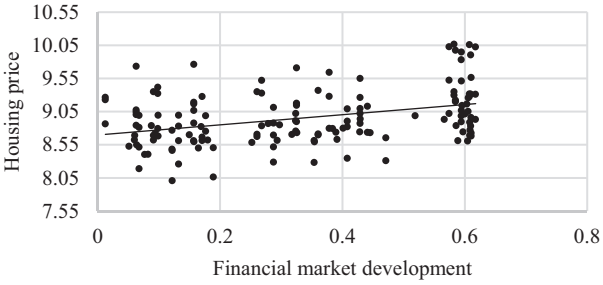
b) High level of financial market development vs Housing prices in full sample



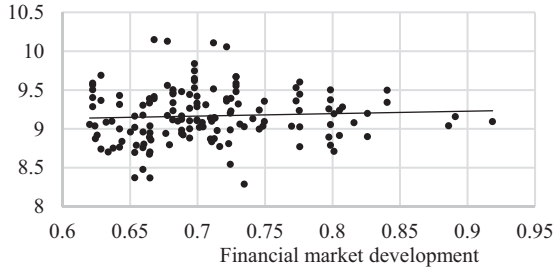
c) Low level of financial market development vs Housing prices at 1st tier cities in China



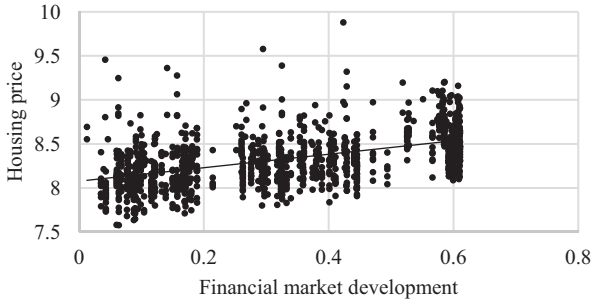
d) High level of financial market development vs Housing prices at 1st tier cities in China



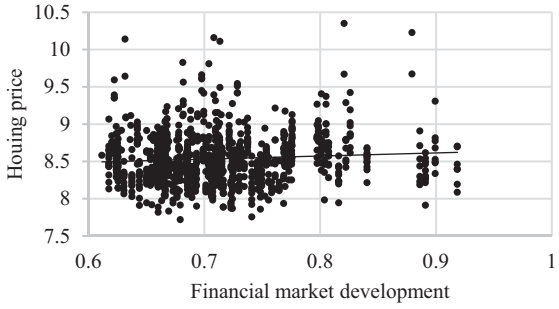
e) Low level of financial market development vs Housing prices at 2nd tier cities in China



f) High level of financial market development vs Housing prices at 2nd tier cities in China



g) Low level of financial market development vs Housing prices at 3rd tier cities in China



h) High level of financial market development vs Housing prices at 3rd tier cities in China

Figure 2. Financial market development vs housing prices in full sample, 1st tier, 2nd tier and 3rd tier cities in China

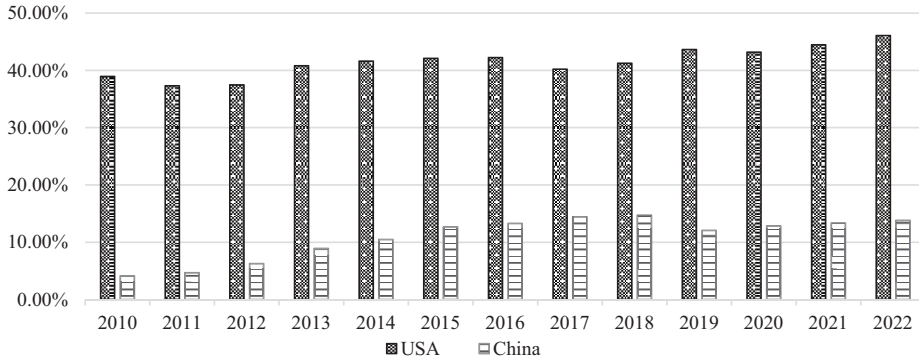


Figure 3. Comparison of the level of financial market development between the USA and China (source: International Monetary Fund, 2024)[2]

and guidelines for improving financial market development in accordance with the national development's aim of ensuring housing affordability, safeguarding the welfare and meanwhile boosting economic development consistently without distortion of resource allocation, corruption, and rent-seeking.

The remainder of this paper is organized as follows: The second section highlights the relevant literature. The third section presents data source, defines variables, and outlines the empirical methodology. The fourth section interprets the empirical findings, while the fifth section summarizes the study and suggests possible policy implications.

2. Literature review

High housing prices have impeded the sustainable development of China's economy and residents' living standards and have also attracted a great deal of attention from academia and the government. Real estate has the dual attributes of investment and consumption, implying the composition of housing prices is more complex than the asset price of others. Demand and supply theory serves as the most crucial perspective when investigating the fundamental determinants of housing prices.

Demographic factors mainly affect housing prices in terms of demographic structure, population mobility, and population size. Regarding demographic structure, Saita et al. (2016) find that the old-age dependency ratio negatively affects housing prices. Other scholars such as Saiz (2007) and Lu and Chen (2014) discuss the reasons for the rapid increase in housing prices based on the perspective of population mobility. Housing prices are higher in cities with a higher proportion of foreigners. Gabriel et al. (1999) find that population migration is the primary driver of housing price changes and fluctuations in the two of the largest cities in California. There is a tendency for housing and land prices to rise as the population increases (Combes et al., 2019). Mankiw and Weil (1989) observe that population inflows can result in a rise in housing prices, especially when the "baby boom" generation enters the real estate market. When the population is concentrated in cities, there will be a huge demand for real estate, thus increasing housing prices.

Public services are among the impacts of the continued rise in housing prices. Housing prices are directly proportional to the area's public services level (Oates, 1969). The better the public services are, the higher the housing price is (Kiel & Zabel, 2008). The quantity and quality of public goods provided by the government is, to some extent, a reflection of the quality of the housing, so the level of public services is reflected in the price of housing, a phenomenon known as "capitalization of public services" (Tiebout, 1956). With the improvement of public utility services, the living environment is increasingly promoted, which has led to the improvement of the urban landscape, and the excellent urban living environment will stimulate the demand for housing (Tiebout, 1956). In addition, public services affect workers' migration decisions, accompanied by population agglomeration, resulting in a sustained rise in urban housing prices (Clark & Hunter, 1992; Dustmann & Okatenko, 2014). Government public expenditures are mainly spent on infrastructure, health care, education, and transport. Therefore, this paper adopts the per capita fiscal expenditure to represent the level of public services.

Economic fundamentals are among the causes of high housing prices. Gross domestic product (GDP) is a standard indicator of the economic development level (Dědeček & Dudzich, 2022), reflecting the degree of growth of the national economy, the quality of life of residents, and the level of material welfare security (Islam & Clarke, 2002). The high level of economic development is conducive to promoting purchasing power and stimulating the demand for real estate, so real estate prices begin to rise; when the economy is improving, real estate prices are expected to climb up, stimulating more investment demand. This paper adopts GDP per capita to measure the economic situation of a city.

[2] The financial market development is calculated by the ratio of financial assets to total assets in the two countries.

Numerous studies have demonstrated a positive correlation between wage levels and housing prices (Antolin & Bover, 1997; Hoehn et al., 1987). Regarding housing demand, wages signify income, acknowledged as a decisive factor in maintaining high housing prices (Gallin, 2006). Similar results were arrived at by Holly et al. (2010), referring to the sample in the United States, and Bischoff (2012), applying cross-sectional data on most German counties. Per capita income is the main factor affecting property prices, and the increase in demand triggered by rising incomes will lead to higher property prices (Bischoff, 2012; McQuinn & Reilly, 2008; Chow & Niu, 2015). With the increase in residents' income, the demand will also rise, thus contributing to the rise of housing prices (Kenny, 1999).

Air pollution (AP) significantly harms human health, leading to various respiratory and cardiovascular diseases. Consequently, severe air pollution creates a strong deterrent, driving residents to move out of affected cities to seek healthier environments (Chen et al., 2012). This phenomenon is evident as individuals prioritize their well-being and quality of life, which makes them more inclined to relocate to areas with quality living environment. From the perspective of demand theory, which examines consumer preferences and behaviors, air pollution is expected to affect housing prices negatively. When air quality deteriorates, the desirability of living in polluted areas declines, reducing the demand for housing and subsequently lowering property values. This relationship underscores the importance of environmental factors in real estate markets. In this study, the PM 2.5 index represents a city's air pollution, as it is a standard measure of delicate particulate matter that significantly impacts air quality and health.

Interest rates play a crucial role in shaping housing prices, and numerous studies claim that interest rates hold a negative effect on housing prices. An increase in interest rates usually indicates a rise in the cost of buying a home and implies an increase in the burden of monthly payments, thereby dampening purchasing power, inhibiting housing demand (Bernanke & Gertler, 1995) and resulting in a decrease in housing prices. Also, rising interest rates means high return rates on other financial assets, like bonds and savings, which will stimulate speculators to divert their capital from the real estate market to financial market. Tsatsaronis and Zhu (2004), in a study of 17 developed countries, found that a 1 percent fall in interest rates led to 1.2 percent increase in housing prices. Dolde and Tirtiroglu (2002) argued that housing prices fluctuations were more stable when interest rates were low and more volatile when interest rates were high. Using U.S. data from 1986 to 1996, Fratantoni and Schuh (2003) found that interest rates were negatively related to housing investment and housing appreciation.

Limited existing literature investigates the factors that affect housing prices from the perspective of financial market development. So, the impact of financial market development on housing prices has not yet been fully examined. Stockhammer (2010) defines financial market development broadly as the growing importance of the financial sector in the economy, which is essential for alleviating the information asymmetry between the supply and demand of capital and optimizing the efficiency of capital allocation. China's financial market is intrinsically deficient, and its financing and investment functions could be more effective (Gao et al., 2022), and accordingly needs to be improved. To support the economic development, China government has injected vast amounts of money into the market. However, the issued money has no channels to invest in, so much of it floods into the real estate market, and the real estate industry gradually deviates from its residential attributes to its financial attributes, which is the main reason for the rapid rise of housing prices in China. The financial market is the most direct and extensive market involving investing and financing, and only when the financial market achieves healthy and orderly development can it provide the speculators with a preferred investing channel. Also, well-functioning financial market can also improve the property income of residents, avoid the limited investment channels and the influx of investment funds into the real estate market, and as a result solve the overheating phenomenon in China's real estate. Accordingly, this paper hypothesizes that financial market development contributes to lower housing prices.

The existing studies that analyze the reason for the rise in housing prices are primarily based on the demand and supply theory, including elements such as economic level, income, living environment, public services, population and loan interest rates. However, due to the differences in the research perspectives, methodologies, and data, there are still some different viewpoints, especially the explanation for the continuous and rapid rise in housing prices, which needs to be more convincing. Therefore, this research is beneficial in supplementing current literature and holds a vital reference significance for government supervision.

3. Methodology

Based on the above analysis, it is assumed that financial market development has a negative effect on housing prices, and the low level of financial market development in China makes it a potential in curbing rising housing prices. Hence, the basic model is formulated by adding financial market development (*FIN*) into the equation.

$$HP_{it} = \beta_0 + \beta_1 FIN_{it} + \varepsilon_{it}, \quad (1)$$

where: i indicates the city; t is the time (year); ε_{it} is an error term. The slope of the parameter β_1 is expected to be negative. As is concluded in the literature reviews above, it is suggested that financial market development (*FIN*) is insufficient to represent the impact on housing prices. Therefore, in order to more accurately depict the impacts on housing prices, the equation is extended as follows:

$$HP_{it} = \beta_0 + \beta_1 FIN_{it} + \beta_2 POPU_{it} + \beta_3 PS_{it} + \beta_4 PGDP_{it} + \beta_5 PW_{it} + \beta_6 AP_{it} + \beta_7 RATE_{it} + \gamma_1 HP_{i,t-1} + u_i + \varepsilon_{it}. \quad (2)$$

This equation incorporates financial market development (*FIN*), population size (*POPU*), public services (*PS*), per capita GDP (*PGDP*), per capita wage (*PW*), air pollution (*AP*), and loan interest rates (*RATE*). In Equation (2), u_i captures unobserved city-specific effect. Equation (2) includes the lag of housing prices for one period ($HP_{i,t-1}$) to better depict the impact on housing prices due to market inertia, making the model a dynamic one. Supposing housing prices in the past, investors may see it as a lucrative opportunity to continue to invest in real estate, which may lead to more speculating activities and thus push up housing prices. Therefore, incorporating lagged housing prices for one period as a potential impact is a sensible method to accurately depict the housing prices fluctuation.

Considering the nature of the dynamic panel data used in this study, the standard panel models such as pooled, fixed effect, and random effect models are biased and therefore unsuitable when city-specific effects, lagged dependent variables, or potential endogeneity of explanatory variables are present (Ibrahim & Law, 2014). As such, the generalized method of moments (GMM) technique is applied to estimate the model. Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) are among those who manifest that GMM is accompanied by endogeneity and biased as a result of the lagged explanatory variables that are not strictly exogenous. To further conduct our discussion, Equation (2) can be simplified as follows:

$$HP_{it} = \beta_0 + \gamma_1 HP_{i,t-1} + \beta X_{it} + u_i + \varepsilon_{it}\,, \tag{3}$$

where: X is a set of macroeconomic variables representing a city's characteristics that may affect housing prices, and the lagged dependent variable ($HP_{i,t-1}$) makes it a dynamic model. Error term ε_{it} is independent and identically distributed. The estimator introduced by Arellano and Bond (1991) and initially proposed by Anderson and Hsiao (1981), known as the difference GMM, adopts lged values of the endogenous variable as instruments. The first difference GMM nes tbe adopted to eliminate the city-specific effect which is given by:

$$\begin{aligned} &HP_{i,t} - HP_{i,t-1} = \gamma_1\left(HP_{i,t-1} - HP_{i,t-2}\right) + \\ &\beta(X_{i,t} - X_{i,t-1}) + \left(\varepsilon_{i,t} + \varepsilon_{i,t-1}\right). \end{aligned} \tag{4}$$

This procedure eliminates the city-specific time-invariant (u_i), removing the individual-specific uved effect. However, it causes a correlation between the lagged difference of dependent variable $\left(HP_{i,t-1} - HP_{i,t-2}\right)$ and the lagged difference of error term $\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)$, which makes $\left(HP_{i,t-1} - HP_{i,t-2}\right)$ an endogenous variable. Simultaneously, it produces potentially biased and inconsistent results that cannot be accepted in econometrics.

Instruments need be selected to address this issue. Anderson and Hsiao (1981) proposed applying $HP_{i,t-2}$ as a replacement of $\left(HP_{i,t-1} - HP_{i,t-2}\right)$. According to similar logic, higher-lagged variables are also valid instruments, as proposed by Anderson and Hsiao (1981). Arellano and Bond (1991) proposed adopting all the lagged levels of $HP_{i,t-T}$ ($T \geq 2$) as the instruments, which is commonly called difference GMM. If ($X_{i,t}$) is not strictly exogenous, let say predetermined or endogenous, then lagged level of $X_{i,t}$ like $X_{i,t-1}$, $X_{i,t-2}$, and $X_{i,t-3}$ can also be utilized as instruments of ($X_{i,t} - X_{i,t-1}$). However, if there is a long enough period, weak instrument problems may occur because of the large scale of instruments. One measure to address this issue is to constrain the maximum lagged number to control the quantity of instruments.

Time-invariants are eliminated and thus cannot be estimated when the equation is lagged. Moreover, if the explanatory variables are strongly continuous, the first-order autoregressive coefficient (γ_1) is close to 1, and the correlation between $HP_{i,t-2}$ and $HP_{i,t-1} - HP_{i,t-2}$ may be weak, leading to a weak instrumental variable problem. To settle the issues mentioned above, we can go to the level equation where $\{\Delta HP_{t-1}, \Delta HP_{t-2}, \Delta HP_{t-3} \ldots\}$ can be taken as the instruments of $HP_{i,t-1}$ under the condition that there is no autocorrelation for error term $\varepsilon_{i,t}$. This estimator is known as level GMM.

Blundell and Bond (1998) combined the difference GMM and level GMM as a synthetic system known as system GMM. Compared to either level GMM or difference GMM, the system-GMM estimator has some advantages. First, the system GMM has been verified more efficiently a can estimate the time-invariants. Second, it mitigates potential biases of the difference estimator ismall samples. Furthermore, the system-GMM can also control the potential endogeneity ol regressors. Two-step system GMM could correct heteroscedasticity of the residuals, and a finite sample correction is made to the two-step covariance matrix using the method of Windmeijer (2005). Therefore, the system-GMM estimator is recommended as the most crucial reference in following empirical analysis in this study.

GMM is valid and consistent only when the error term $\varepsilon_{i,t}$ in Equation (3) is not serially correlated. Thus, tests need to be performed. Even if the original assumption is that the error term $\varepsilon_{i,t}$ is not autocorrelated, the first-order differences of the error term $\Delta\varepsilon_{i,t}$ will still be autocorrelated. The reason is as follows.

$$\begin{aligned} &Cov\left(\Delta\varepsilon_{i,t}, \Delta\varepsilon_{i,t-1}\right) = Cov\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}, \varepsilon_{i,t-1} - \varepsilon_{i,t-2}\right) = \\ &-Cov\left(\varepsilon_{i,t-1}, \varepsilon_{i,t-1}\right) = -Var\left(\varepsilon_{i,t-1}\right) \neq 0 \end{aligned} \tag{5}$$

However, the second or higher order differences of error term $\varepsilon_{i,t}$ is not serial-correlated.

$$Cov\left(\Delta\varepsilon_{i,t}, \Delta\varepsilon_{i,t-k}\right) = 0,\ k \geq 2. \tag{6}$$

For this reason, it needs to be tested whether the error term $\varepsilon_{i,t}$ is autocorrelated by checking if there is first or second-order autocorrelation in the difference of the error terms, known as AR (1) or AR (2) (Arellano & Bond, 1991). Suppose no second-order autocorrelation, or AR (2), is not rejected. Then, it is verified that there is no serial correlation of error term $\varepsilon_{i,t}$ (Baltagi, 2008). Another neces-

Table 1. List of variables, definition and measurement

		Measurement
HP	Housing prices	Average annual selling price of commercial housing for a city
FIN	Financial market development	This comprehensive index is generated by the entropy method from three sub-indicators: the ratio of financial assets to total assets (*FIN*1), the ratio of financial professionals to the total employed population (*FIN*2), and the ratio of added value in the financial industry to GDP (*FIN*3)
POPU	Population size	The size of a city's population at the end of the year
PS	Level of public service	Per capita public expenditure
PGDP	Level of economic development	Per capita GDP
PW	Employee's income level	The average salary of employees
AP	Living environment (represented by air quality)	PM2.5 (Pulmonary particulate matter index, (ug/m^3)
RATE	Interest rate for loans	Base interest rate for loans of five years or above

sary test is the Hansen Test for overidentifying restrictions to test the validity tnstruments. Failure to reject the null hypothesis of the Hansen test and the number oftruments does not exceed the number of observations indicates no weak instruments and no overfitting issues, and thus the model is correctly specified.

Independent variable financial market development (*FIN*) and dependent variable housing prices (*HP*) are the focal variables in this study. Financial market development is a composite index with three sub-indicators reflecting the breadth and depth, namely the ratio of financial assets to total assets (*FIN*1), the ratio of financial professionals to the total employed population (*FIN*2), the ratio of added value in the financial industry to GDP (*FIN*3). These sub-indicators provide sufficient information from three different dimensions namely asset distribution, labor force allocation, and economic contribution, which help to comprehensively reveal the mechanisms through which financial market development affects the economic system as well as the real estate market. The ratio of financial assets to total assets measures the importance of financial assets in the overall economic system, reflecting the impact of financial market development on asset allocation; the proportion of financial sector employees reflects the absorption capacity of the financial sector for human resources; and the financial sector value-added to GDP ratio measures the contribution of the financial sector to the overall economy, reflecting the direct impact of financial market development on the macroeconomy. To determine the composite index of financial market development requires not only the establishment of accessible specific indicators, but also the assignment of weights to the relevant indicators. The entropy value method is an objective assignment method, which determines the weight of indicators based on the information entropy. Due to the advantages of objectivity, applicability, sensitivity and no need for normalization, entropy method by stata17 is adopted to construct the composite index of financial market development.

Housing prices (*HP*) is measured by annual average price of commercial housing sales with the data obtained from China Real Estate Information. Except for explanatory variables, several other factors reflecting the characteristics of the city are also selected as control variables. Data for added value in the financial sector is obtained from National Bureau Statistics; financial assets data comes from the International Monetary Funds (IMF); other data comes from the China Urban Statistical Yearbook from 2011 to 2022. Additionally, all data except financial market development and loan interest rate are turned into logarithmic form. The list of variables and measurements are presented in Table 1.

4. Empirical findings and discussion

4.1. Descriptive analysis

As indicated in Table 2, the highest housing prices (*HP*) is recorded at 10.957 (around 8196 USD per square meter). This can be represented by the case of Shanghai in 2021, while the lowest *HP* stand at 7.576 (around 278 USD per square meter), which mainly refers to Yichun city in 2011, located in the northeast of China. Coupled with that, the mean *HP* is 8.571 (around 754 USD per square meter), which is still very high compared to the annual income of employees.

Table 2. Descriptive statistics of variables in the full sample

Variables	Mean	Standard Deviation	Min	Max
HP	8.571	0.468	7.576	10.957
FIN	0.519	0.235	0.013	0.935
POPU	5.877	0.717	3.149	8.075
PS	9.057	0.443	7.535	10.68
PGDP	10.742	0.541	8.801	12.14
PW	10.273	0.322	9.366	11.320
AP	3.539	0.432	1.541	4.673
RATE	5.548	0.878	4.650	6.860

4.2. Baseline regression results

Next, we will discuss the benchmark regression in Table 3. The GMM estimation of the dynamic model is presented in Equation (2). Before explaining the results in depth, it is necessary to check out the model specification,

Table 3. Regression analysis [DV = HP]

	1-Step		2-Step	
	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM
FIN	–0.136***	–0.180***	–0.126***	–0.205***
	[–4.10]	[–6.54]	[–33.27]	[–7.37]
POPU	0.298***	0.0473***	0.360***	0.0625***
	[2.67]	[4.05]	[46.67]	[4.59]
PS	0.195***	0.0787***	0.130***	0.0977***
	[3.66]	[4.74]	[25.52]	[5.12]
PGDP	–0.0135	–0.0117	0.0283***	–0.00123
	[–0.28]	[–0.94]	[30.28]	[–0.08]
PW	0.718***	0.0642	0.694***	0.075
	[11.06]	[1.52]	[99.98]	[1.36]
AP	0.0136	0.0197**	–0.0241***	0.0422***
	[0.75]	[2.11]	[–14.88]	[3.45]
RATE	0.0321***	–0.0230***	0.0217***	–0.0233**
	[3.28]	[–2.79]	[16.40]	[–2.50]
l(1).*HP*	0.163***	0.900***	0.179***	0.873***
	[4.37]	[31.33]	[52.09]	[26.98]
AR (1)	0.000	0.000	0.000	0.000
AR (2)	0.185	0.136	0.121	0.153
Hansen	0.107	0.244	0.194	0.125
#Instruments	234	251	244	235
#Obs	261	261	261	261

Note: Asterisks ***, and ** denote statistical significance at the 1%, and 5% levels, respectively. Figures in [] stand for *t*-statistics. The values of the Hansen and AR tests stand for *p*-value.

over-identifying restriction and residual autocorrelation. First, as shown in Table 3, the coefficients of lagged dependent variables are all significantly positive, verifying that the dynamic model specification is valid. Second, the null hypothesis of second-order autocorrelation (AR2) cannot be rejected, indicating that the error terms in Equation (2) are not autocorrelated. Third, the null hypothesis of the Hansen test cannot be rejected, and the number of instruments doesn't exceed the number of observations, implying the validity of all the instruments and no overfitting issues. All tests above confirm that the specification of GMM is valid.

Concerning financial market development (*FIN*) on housing prices (*HP*), Table 3 demonstrates that financial market development significantly exerts a negative impact on housing prices. It presents that the semi-elasticity of housing prices to financial market development records 0.205 with a significance level of 0.01, meaning one percent increment in financial market development results in 0.205 percent decline in housing prices. High housing prices is potentially associated with the excess inflow of speculating capital channeled to the real estate industry because of the low level of financial market development, which can be a critical force in decreasing housing prices mainly because the financial sector offers an alternative pool that can absorb a large amount of speculating capital. On one hand, financial market development may lead to strict regulation and supervision, reduce market uncertainty and risk, improve market transparency and stability, and reduce the cost of real estate construction by providing more flexible financing products and lower financial burdens of developers. Moreover, financial market development can increase real estate developers' access to finance, making it easier for them to access capital. It can boost the number of housing projects initiated, increase the housing supply and thus balance housing prices. On the other hand, high level of financial market development can provide investors with more and better investment channels and attract more capital to flow into the financial market rather than merely flood into the real estate market, thus reducing the speculative attributes of the real estate market and allowing housing to return to its residential attributes gradually. The empirical results confirm the hypothesis that financial market development is among the impacts that can reduce housing prices.

In terms of the impact of control variables, the effect of population size (*POPU*) on housing prices is observed to be significantly positive in all models, as expected and consistent with past literature (Mankiw & Weil, 1989; Gabriel et al., 1999; Benjamin et al., 2001). Demographic expansion, especially the increment in the young population, can significantly stimulate the demand for property and increase housing prices. Also, as the population increases, urban land supply gets limited, especially in densely populated urban areas. Restricted land supply leads to higher land costs, and developers need to pay higher land costs (Wong et al., 2011; Skaburskis & Tomalty, 2000), which increases costs in housing construction and leads to higher housing prices. Also, it is observed that public service (*PS*) is positively associated with housing prices at a 1% significance level. Public service (*PS*) is reflected by housing prices, a phenomenon that housing prices is the capitalization of public services (Tiebout, 1956). A high level of public services usually represents better education, a high medical level, transportation convenience, and high-quality cultural and entertainment facilities, accompanied by demographic agglomeration, resulting in increased housing prices. The impact of economic development proxied by per capita GDP (*PGDP*) on housing prices is not statistically significant unexpectedly. As for the impact of per capita wage on housing prices, consistent with past literature (Antolin & Bover, 1997; Hoehn et al., 1987), the results show that per capita wage (*PW*) is positively related to housing prices but not significant. Higher income denotes higher purchasing power and thus more robust demand for homeownership, which positively relates to housing prices (Gallin, 2006). The effect of air pollution (*AP*) on housing prices, based on the results from the two-step system GMM, is positive and statistically significant at 1 percent. It can be explained by the fact that cities with high level of air pollution are often more developed in economic dynamics and social conditions which causes population agglomeration and robust housing prices. When focusing on the result of the two-step system, it can be observed that the loan interest rate (*RATE*) is negatively

correlated with housing prices. On the one hand, when interest rates rise, the cost of borrowing money to buy a home increases, which will naturally lead to a heavier burden on home buyers, thus dampening the demand for home ownership. Housing prices may therefore fall as a result. On the other hand, the real estate industry is a capital-intensive industry with a close lending relationship with banks. An increase in interest rates means an increment in the cost of lending, which may force real estate developers to pass on the extra cost to home buyers, thus pushing up house prices.

4.3. Endogenous solutions and robustness check

The conclusion that financial market development negatively affects housing prices will be biased by the endogeneity of the explanatory variable, possibly due to the mutual causality between financial market development and housing prices or omitting variables that can simultaneously affect financial market development and housing prices. For example, financial market development can negatively affect housing prices, but at the same time lower housing prices can also inversely contribute to higher level of financial market development, which will result in endogeneity issues and accordingly makes the conclusion unreliable. This paper employs an instrument approach to mitigate the endogeneity problem. The external variables serve as instruments of financial market development adopting two stage least squares (2SLS) method to verify if the conclusion is unbiased, consistent and reliable.

Firstly, it is to utilize mobile digital payment (DIGPAY) as an instrumental variable due two reasons. On one hand, to some extent digital payment refers to some aspects of financial market development, which often means when mobile digital payment is more widely used, financial market development is more developed. So, it satisfies the correlation condition, namely mobile digital payment is significantly correlated with financial market development. On the other hand, housing prices is affected by a wide range of complex factors, and increasing the adoption of mobile digital payment only means people are becoming more likely to pay through mobile digital payment, which exserts little effect on housing prices directly. Again, it satisfies the exclusivity and exogeneity condition. All in all, mobile digital payment (DIGPAY) can be an effective instrument of

Table 4. Endogeneity solutions and robustness check [DV = HP]

	2SLS			1-Step		2-Step	
	DIGPAY	ALIAC	L2FIN	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM
FINA				–0.895*	–1.11**	–0.891***	–1.219***
				[–1.69]	[–2.00]	[–40.91]	[–67.58]
FIN	–4.174***	–5.895***	–0.581***				
	[–14.73]	[–12.05]	[–4.94]				
POPU	0.203***	0.198***	0.222***	0.529***	0.109***	0.519***	0.103***
	[18.07]	[15.21]	[21.92]	[6.95]	[5.25]	[59.68]	[109.06]
PS	0.436***	0.536***	0.229***	0.157***	0.105***	0.156***	0.124***
	[14.05]	[12.29]	[8.71]	[4.17]	[4.08]	[58.62]	[85.85]
PGDP	–0.133***	–0.192***	0.0131	0.0211	0.0223	0.0210***	–0.0077***
	[–6.20]	[–6.74]	[0.71]	[0.63]	[0.93]	[40.38]	[–19.29]
PW	1.156***	1.175***	1.071***	0.410***	0.156*	0.409***	0.145***
	[26.38]	[22.68]	[27.56]	[6.68]	[1.69]	[151.41]	[69.93]
AP	–0.0971***	–0.0767***	–0.150***	0.0350**	0.0236	0.0349***	0.0220***
	[–5.43]	[–3.75]	[–7.90]	[2.06]	[1.60]	[114.35]	[74.09]
RATE	–0.959***	–1.437***	0.207*	0.0368***	0.014	0.0365***	0.0140***
	[–11.97]	[–10.64]	[1.76]	[3.75]	[1.27]	[80.91]	[44.34]
l(1).*HP*				0.477***	0.774***	0.474***	0.799***
				[11.14]	[14.93]	[222.00]	[470.39]
AR (1)				0.000	0.000	0.000	0.000
AR (2)				0.190	0.133	0.180	0.102
Hansen				0.171	0.179	0.171	0.160
Cragg-Donald F	413.78 (*P* = 0.000)	225.85 (*P* = 0.000)	3338.90 (*P* = 0.000)				
#Instruments				240	246	240	245
#Obs				261	261	261	261

Note: Asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Figures in [] stand for *t*-statistics. The values of the AR, Hansen and Cragg-Donald tests stand for *p*-value.

financial market development. In this study, mobile digital payment is a second dimension which comes from the Digital Inclusive Finance Index (DIFI) by Peking University (2011–2021). Specifically, mobile digital payment refers to three elements, namely number of payments per capita, amount paid per capita, and ratio of high-frequency (50 or more times per year) active users to those who are active one time or more within one year. Indicators with different properties and units of measurement are dimensionless using the Logarithmic Efficacy Function Method, and then the Coefficient of Variation Method is used to derive a composite index of digital payments.

Secondly, a composite index of Alipay account coverage (ALIAC) is employed as another instrument which is also sourced from DIFI by Peking University (2011–2021). Alipay account coverage is a secondary dimension of DIFI referring to some specific aspects, namely number of Alipay accounts per 10,000 people, proportion of Alipay card users, average number of bank cards tied to each Alipay account. The composite index of Alipay account coverage is constructed by the same way of constructing mobile digital payment, and is an effective instrument due the satisfaction of correlation and exclusivity. As Alipay account coverage is significantly correlated with financial market development, but holds no direct influence on housing prices.

Meanwhile, this study draws on the study of He and Liu (2019) and selects financial market development with a two-period lag as an instrumental variable (L2FIN) for testing. Due to market inertia, previous financial market development significantly affects current financial market development, but two-period lagged financial market development has a weak impact on current housing prices. Thus, the conditions of correlation and exclusivity for being an effective instrumental variable are met.

From the results of 2SLS indicated in Table 4, the coefficients of *FIN* are significantly negative at 1 percent level, and the Cragg-Donald Wald *F* statistics are 413.78, 225.85, 3338.90 respectively and are all more than 10 significant at the 1% level, confirming the absence of weak correlation between instruments and financial market development. Thus, after mitigating endogeneity, the dampening effect of financial market development on housing prices remains significantly negative.

To further check the robustness of the baseline regression findings, the alternative financial market development index is employed to verify the sensitivity and accuracy of the baseline findings. The same sub-indicators, namely ratio of financial assets to total assets (*FIN*1), ratio of financial professionals to the total employed population (*FIN*2), and ratio of added value in the financial industry to GDP (*FIN*3), are applied to build another composite index (*FINA*) for financial market development to replace *FIN* (generated from entropy). *FINA* is constructed from Equation (7).

$$FINA = \frac{FIN1 + FIN2 + FIN3}{3}. \quad (7)$$

From the results of GMM indicated Table 4, the null hypothesis of second-order autocorrelation (AR2) cannot be rejected, confirming that the error terms are not autocorrelated. In addition, the Hansen test suggests that the null hypothesis of over-identification cannot be rejected and the number of instruments doesn't exceed the number of observations, confirming the validity of all the instruments and no overfitting issues. The findings align with the above conclusion from entropy method that financial market development significantly decreases housing prices.

4.4. Analyses of sub-indicators

Now, move on to investigating the effect of the three sub-indicators on housing prices (*HP*) presented in Table 5. It is necessary to check whether the model is correctly specified. Firstly, under the serial correlation test, failure to reject the absence of the second-order serial correlation AR (2) verify no residual autocorrelation. Secondly, it is reasonable to perform the overidentifying test of instruments, verified by the Hansen test, where the null hypothesis cannot be rejected and the number of instruments does not exceed the number of observations, indicating the validity of all the instruments and no overfitting issues.

As presented in in Table 5, it is found that *FIN*1 (the ratio of financial assets to total assets) hurts housing prices statistically at 1 percent. The semi-elasticity of *FIN*1 to housing prices implies that a 1 percent increase in the ratio of financial assets to total assets contributes to a 0.0498 percent decline in housing prices. To the extent that the ratio of financial assets to total assets increases, it usually signals there is a wide range of options for speculators to invest in financial markets such as the stock market, bond market, forex market, and derivative market, rather than merely channeling their capital to real estate industry. So, it is commonly thought that the financial market provides a forceful crowding-out strength, driving speculating capital diversion from the real estate market to the financial market.

The results also confirm that a 1 percent increment in the ratio of financial professionals to the total employed population (*FIN*2) leads to a fall of 3.92 percent in housing prices. The rising ratio of people working in the financial sector tends to be accompanied by a boom in the financial market. This can also result in more willingness of speculators to direct their money into the financial market rather than merely the real estate market.

Then, moving to examine the effect of *FIN*3 (the ratio of added value in the financial industry to GDP), it is uncovered that *FIN*3 is negatively related to housing prices at a 1 percent level, and a 1 percent increase in *FIN*3 contributes to a 6.204 percent decline in housing prices. The rising ratio of added value in the financial sector to GDP suggests that the financial market is increasingly more lucrative, the scale of the financial sector is expanding, and accordingly the financial sector is attracting an increasing quantity of capital to inflow into.

Table 5. Regression of sub-indicators on housing prices based on 2-Step [DV = HP]

	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM
*FIN*1	–0.309***	–.0498***				
	[–15.56]	[–5.26]				
*FIN*2			–15.622***	–3.92***		
			[–3.86]	[–17.26]		
*FIN*3					–5.528***	–6.204***
					[–146.14]	[–156.90]
POPU	0.315***	0.137***	1.243	0.105***	0.509***	0.137***
	[32.48]	[111.13]	[1.64]	[73.17]	[74.56]	[143.17]
PS	0.0860***	0.0949***	0.722***	0.124***	0.176***	0.0890***
	[17.15]	[62.23]	[3.81]	[34.22]	[51.15]	[64.47]
PGDP	0.00463***	0.0587***	–0.397	0.00375***	0.0190***	0.0721***
	[2.94]	[74.46]	[–1.40]	[3.02]	[31.97]	[129.12]
PW	0.857***	0.154***	–0.421	0.189***	0.302***	0.0965***
	[97.64]	[78.27]	[–0.65]	[43.55]	[86.23]	[37.31]
AP	–0.0244***	0.0452***	0.240**	0.0111***	0.0253***	0.0344***
	[–49.18]	[178.40]	[2.52]	[5.53]	[79.27]	[122.71]
RATE	0.0514***	0.0236***	–0.153*	0.0347***	0.00607***	–0.0194***
	[76.99]	[55.99]	[–1.73]	[45.03]	[14.78]	[–65.11]
l(1).*HP*	0.118***	0.727***	1.588***	0.776***	0.522***	0.743***
	[41.99]	[379.93]	[2.69]	[251.12]	[249.82]	[537.62]
AR (1)	0.000	0.000	0.060	0.000	0.000	0.000
AR (2)	0.196	0.149	0.993	0.151	0.334	0.397
Hansen	0.121	0.167	0.771	0.184	0.120	0.246
#Instruments	237	245	11	246	232	253
#Obs	261	261	261	261	261	261

Note: Asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Figures in [] stand for *t*-statistics. The values of the Hansen and AR tests stand for *p*-value. The model is estimated to use the two-step GMM with robust estimation.

4.5. Heterogeneity analysis

China is a huge country, consisting of hundreds of cities with varying characteristics of economic dynamics, distinct social environment and regulatory policy. Accordingly, there exists an obvious disparity in real estate market and housing prices across cities (Chin & Li, 2021). Heterogeneity analysis across cities enables the government to comprehensively understand the challenges of the housing prices in specific category of cities. This helps to provide an innovative insight which is conducive to the introduction of specific regulations to stabilize housing prices, mitigating potential risks, boosting sustainable development, and enhancing residents' well-fare. Therefore, with an aim to comprehensively investigate the heterogenous impacts of the financial market development on housing prices across varying diversification of cities, this study categorizes the whole sample of China's cities into first-tier, second-tier and third-tier cities, based on China City Business Attractiveness Ranking (2024). Just to be clear, classifying first-tier cities or the second-tier cities as a standalone group respectively creates statistical concerns due to the limited number of observations. Accordingly, first-tier cities and second-tier cities are combined as a single group so as to increase the sample size and achieve more robust results.

The null hypothesis of second-order autocorrelation (AR2) cannot be rejected, indicating that the error terms are not autocorrelated. Also, the null hypothesis of the Hansen test is accepted, and the number of instruments doesn't exceed the number of observations, implying the validity of all the instruments and no overfitting issues. All tests above confirm that the specification of GMM is valid.

As depicted in Table 6, the results indicate that the financial market development significantly affect housing prices at 1 percent level in third-tier cities in China. The reason why financial market development exserts a downward pressure on housing prices is that more developed financial market development can divert speculative capital from the real estate sector to financial market like stocks, securities, bonds, futures and options. Nonetheless, the results indicates that financial market development negatively affects housing prices in first-tier and second-tier cities at only 5 percent level. China's first-tier and second-tier cities are over-concentrated due to the developed economy, more job opportunities, and quality public services, resulting in extreme demand of residential housing combined with the excessive speculation demand, while the housing supply is limited due to the restricted land space and inelasticity of real estate supply

Table 6. Heterogeneity analysis based on 2-Step [DV = HP]

	First & second-tier		Third-tier	
	DIF-GMM	SYS-GMM	DIF-GMM	SYS-GMM
FIN	–0.297**	–0.237**	–0.0921***	–0.153***
	[–2.27]	[–2.23]	[–12.24]	[–47.67]
POPU	0.0231	0.041	–0.0113	0.0725***
	[0.03]	[0.45]	[–0.89]	[34.96]
PS	–0.139	–0.0169	0.169***	0.0492***
	[–0.46]	[–0.12]	[29.09]	[15.98]
PGDP	–0.278	0.308	–0.0660***	0.0243***
	[–0.75]	[1.25]	[–37.98]	[23.45]
PW	1.281*	–0.174	0.827***	0.133***
	[1.85]	[–0.94]	[127.42]	[22.68]
AP	0.101*	0.0753	–0.0258***	0.0313***
	[1.73]	[0.86]	[–13.56]	[16.72]
RATE	–0.0478*	–0.0842**	0.0466***	–0.0136***
	[–1.73]	[–2.40]	[19.93]	[–10.18]
l(1).*HP*	0.206**	0.921***	0.105***	0.797***
	[2.10]	[9.59]	[23.60]	[239.84]
AR (1)	0.077	0.004	0.000	0.000
AR (2)	0.297	0.917	0.116	0.172
Hansen	0.224	0.154	0.165	0.133
#Instruments	45	43	198	197
#Obs	46	46	215	215

Note: Asterisks ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Figures in [ ] stand for *t*-statistics. The values of the Hansen and AR tests stand for *p*-value. The model is estimated to use the two-step GMM with robust estimation.

in the short run, which weakens the lowering effect of financial market developments on housing prices. So, housing prices in first-tier and second-tier cities is affected by a combination of complex factors with the financial market development playing a relatively less effective role in reshaping housing prices.

5. Conclusions

This paper investigates the impact of financial market development on housing prices with a sample including 261 cities in China from 2011 to 2021. We conduct an empirical investigation using GMM estimation, where the financial market development is proxied by a composite index generated from three sub-indicators. More specifically, this study empirically examines whether housing prices decreases when an increment in the level of financial market development exists. As financial market development is increasingly improving, it can provide a substitutionally lucrative investment channel. Our analysis provides supporting evidence that financial market development is among the strengths that could curb rising housing prices.

Also, heterogeneity analysis shows that the effectiveness of financial market development on housing prices in third-tier cities is more significant compared to first-tier and second-tier cities, implying implementing policy to lower housing prices by promoting financial market development in third-tier cities is more likely to achieve an expectation. Referring to the effects of the three sub-indicators reflecting the level of financial market development in three dimensions, the results show the three sub-indicators are all negatively correlated with housing prices with the same significance. Noticeably, the policy that aims to regulating rising housing prices by promoting the ratio of financial assets to total assets, the ratio of the added value in the financial sector to GDP and the ratio of financial practitioners to the total employed population are all confirmed reliable and practical.

Specifically, for governments several measures can be implemented to promote financial market development to decrease housing prices. Financial regulatory reforms, improving financial infrastructure, broadening access to financial services, fintech innovation, promoting international integration of financial markets, and improving financial openness are all among the policies promoting financial market development. Especially, developing robust capital markets, such as equity and futures markets, can promote financial market development by providing investors with more opportunities for portfolio diversification and wealth creation.

Nevertheless, we should also be cautious about the implication of this study, which aims to demonstrate the need to promote financial market development as one of the channels for absorbing speculative capital inflows to curb rising housing prices, rather than providing excessive financial support to the real estate sector. Therefore, the government should ensure that any policy to promote financial market development is supposed to consistently reduce the inflow of speculative capital into the real estate sector. Another point that cannot be ignored is when tremendous amounts of currency issued by the government pour into the financial sector in the short run, it will cause significant volatility in financial market, which is harmful due to the increasing possibility of financial risks. So, in the long term the government is supposed to enhance the breadth and depth of the financial market to guarantee the stable development of the financial market, and it is necessary to regulate the pace and volume of currency issuance. Only in this way can financial market development reduce housing prices while maintaining the stability of financial markets and finally improving the welfare of citizens consistently.

Acknowledgements

We acknowledge the contributions of the reviewers and the journal editor, who helped to refine and strengthen the ideas in the article.

Funding

We declare that there is no funding that supports this study.

Author contributions

Wencheng Zhang: Original idea, data curation, formal analysis, resources, writing of the original draft. Tajul Ariffin Masron: Conceptualisation, methodology, supervision, validation, review and editing.

Disclosure statement

We declare that we are not, in any way have any competing financial, professional, or personal interests.

References

Aladangady, A. (2017). Housing wealth and consumption: Evidence from geographically linked microdata. *American Economic Review*, *107*(11), 3415–3446. https://doi.org/10.1257/aer.20150491

Anderson, T. W., & Hsiao, C. (1981). Estimation of dynamic models with error components. *Journal of the American Statistical Association*, *76*(375), 598–606. https://doi.org/10.1080/01621459.1981.10477691

Antolin, P., & Bover, O. (1997). Regional migration in Spain: The effect of personal characteristics and of unemployment, wage and house price differentials using pooled cross-sections. *Oxford Bulletin of Economics and Statistics*, *59*(2), 215–235. https://doi.org/10.1111/1468-0084.00061

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Baltagi, B. H. (2008). *Econometric analysis of panel data* (Vol. 4). Wiley.

Beck, T., Levine, R., & Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, *58*(1–2), 261–300. https://doi.org/10.1016/S0304-405X(00)00072-6

Benjamin, J. D., Donald Jud, G., & Winkler, D. T. (2001). The value of smoking prohibitions in vacation rental properties. *The Journal of Real Estate Finance and Economics*, *22*, 117–128. https://doi.org/10.1023/A:1007835511752

Bernanke, B. S., & Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, *9*(4), 27–48. https://doi.org/10.1257/jep.9.4.27

Bischoff, O. (2012). Explaining regional variation in equilibrium real estate prices and income. *Journal of Housing Economics*, *21*(1), 1–15. https://doi.org/10.1016/j.jhe.2011.11.002

Bleck, A., & Liu, X. (2018). Credit expansion and credit misallocation. *Journal of Monetary Economics*, *94*, 27–40. https://doi.org/10.1016/j.jmoneco.2017.09.012

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Chen, J., & Gao, B. (2012). Research on credit constraints, housing prices and resident consumption rate based on panel threshold model. *Journal of Financial Research*, *12*(4), 45–57.

Chin, L., & Li, X. (2021). House price and bank credit in China: Analysis of first- and second-tier cities. *International Journal of Housing Markets and Analysis*, *14*(4), 779–795. https://doi.org/10.1108/IJHMA-05-2020-0061

Chow, G. C., & Niu, L. (2015). Housing prices in urban China as determined by demand and supply. *Pacific Economic Review*, *20*(1), 1–16. https://doi.org/10.1111/1468-0106.12080

Clark, D. E., & Hunter, W. J. (1992). The impact of economic opportunity, amenities and fiscal factors on age-specific migration rates. *Journal of Regional Science*, *32*(3), 349–365. https://doi.org/10.1111/j.1467-9787.1992.tb00191.x

Combes, P. P., Duranton, G., & Gobillon, L. (2019). The costs of agglomeration: House and land price in French cities. *The Review of Economic Studies*, *86*(4), 1556–1589. https://doi.org/10.1093/restud/rdy063

Cristini, A., & Sevilla, A. (2014). Do house price affect consumption? A re-assessment of the wealth hypothesis. *Economica*, *81*(324), 601–625. https://doi.org/10.1111/ecca.12098

Dědeček, R., & Dudzich, V. (2022). Exploring the limitations of GDP per capita as an indicator of economic development: A cross-country perspective. *Review of Economic Perspectives*, *22*(3), 193–217. https://doi.org/10.2478/revecp-2022-0009

Dolde, W., & Tirtiroglu, D. (2002). Housing prices volatility changes and their effects. *Real Estate Economics*, *30*(1), 41–66. https://doi.org/10.1111/1540-6229.00029

Dustmann, C., & Okatenko, A. (2014). Out-migration, wealth constraints, and the quality of local amenities. *Journal of Development Economics*, *110*, 52–63. https://doi.org/10.1016/j.jdeveco.2014.05.008

Fratantoni, M., & Schuh, S. (2003). Monetary policy, housing, and heterogeneous regional markets. *Journal of Money, Credit and Banking*, *35*, 557–589. https://doi.org/10.1353/mcb.2003.0029

Gabriel, S. A., Mattey, J. P., & Wascher, W. L. (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.

Gallin, J. (2006). The long-run relationship between house price and income: Evidence from local housing markets. *Real Estate Economics*, *34*(3), 417–438. https://doi.org/10.1111/j.1540-6229.2006.00172.x

Gao, Y., Zhao, C., Sun, B., & Zhao, W. (2022). Effects of investor sentiment on stock volatility: New evidences from multi-source data in China's green stock markets. *Financial Innovation*, *8*(1), Article 77. https://doi.org/10.1186/s40854-022-00381-2

Goodhart, C., & Hofmann, B. (2000). Do asset price help to predict consumer price inflation? *The Manchester School*, *68*, 122–140. https://doi.org/10.1111/1467-9957.68.s1.7

He, F., & Liu, H. X. (2019). Assessment of the performance improvement effect of digital change in physical enterprises under the perspective of digital economy. *Reform*, (4), 137–148.

Hoehn, J. P., Berger, M. C., & Blomquist, G. C. (1987). A hedonic model of interregional wages, rents, and amenity values. *Journal of Regional Science*, *27*(4), 605–620. https://doi.org/10.1111/j.1467-9787.1987.tb01184.x

Holly, S., Pesaran, M. H., & Yamagata, T. (2010). A spatio-temporal model of house price in the USA. *Journal of Econometrics*, *158*(1), 160–173. https://doi.org/10.1016/j.jeconom.2010.03.040

Ibrahim, M. H., & Law, S. H. (2014). Social capital and CO_2 emission–output relations: A panel analysis. *Renewable and Sustainable Energy Reviews*, *29*, 528–534. https://doi.org/10.1016/j.rser.2013.08.076

International Monetary Fund. (2024). *IMF data*. https://data.imf.org

Islam, S. M., & Clarke, M. (2002). The relationship between economic development and social welfare: A new adjusted GDP

measure of welfare. *Social Indicators Research*, *57*, 201–229. https://doi.org/10.1023/A:1014481414637

Jordà, Ò., Schularick, M., & Taylor, A. M. (2015). Betting the house. *Journal of International Economics*, *96*, S2–S18. https://doi.org/10.1016/j.jinteco.2014.12.011

Kenny, G. (1999). Modelling the demand and supply sides of the housing market: Evidence from Ireland. *Economic Modelling*, *16*(3), 389–409. https://doi.org/10.1016/S0264-9993(99)00007-3

Kiel, K. A., & Zabel, J. E. (2008). Location, location, location: The 3L Approach to house price determination. *Journal of Housing Economics*, *17*(2), 175–190. https://doi.org/10.1016/j.jhe.2007.12.002

King, R. G., & Levine, R. (1993). Finance, entrepreneurship, and growth: Theory and evidence. *Journal of Monetary Economics*, *32*(3), 513–542. https://doi.org/10.1016/0304-3932(93)90028-E

Lu, M., & Chen, B. (2014). Rationality or bubble: Empirical research on urbanization, immigration and housing prices. *The Journal of World Economy*, (1), 30–54.

Mankiw, N. G., & Weil, D. N. (1989). The baby boom, the baby bust, and the housing market. *Regional Science and Urban Economics*, *19*(2), 235–258. https://doi.org/10.1016/0166-0462(89)90005-7

McQuinn, K., & O'Reilly, G. (2008). Assessing the role of income and interest rates in determining house prices. *Economic Modelling*, *25*(3), 377–390. https://doi.org/10.1016/j.econmod.2007.06.010

Numbeo. (2022). *Numbeo cost of living*. https://www.numbeo.com

Oates, W. E. (1969). The effects of property taxes and local public spending on property values: An empirical study of tax capitalization and the Tiebout hypothesis. *Journal of Political Economy*, *77*(6), 957–971. https://doi.org/10.1086/259584

People's Bank of China. (2024). *China monetary policy report Q4 2023*. http://www.pbc.gov.cn/en/3688229/3688353/3688356/4756453/5330013/2024041610102997035.pdf

Reinhart, C. M., & Rogoff, K. S. (2009). *This time is different: Eight centuries of financial folly*. Princeton University Press. https://doi.org/10.1515/9781400831722

Richter, B., Schularick, M., & Wachtel, P. (2021). When to lean against the wind. *Journal of Money, Credit and Banking*, *53*(1), 5–39. https://doi.org/10.1111/jmcb.12701

Rousseau, P. L., & Wachtel, P. (2011). What is happening to the impact of financial deepening on economic growth? *Economics Letters*, *110*(2), 138–140.

Saita, Y., Shimizu, C., & Watanabe, T. (2016). Aging and real estate price: Evidence from Japanese and US regional data. *International Journal of Housing Markets and Analysis*, *9*(1), 66–87. https://doi.org/10.1108/IJHMA-11-2014-0053

Saiz, A. (2007). Immigration and housing rents in American cities. *Journal of Urban Economics*, *61*(2), 345–371. https://doi.org/10.1016/j.jue.2006.07.004

Skaburskis, A., & Tomalty, R. (2000). The effects of property taxes and development cost charges on urban development: Perspectives of planners, developers and finance officers in Toronto and Ottawa. *Canadian Journal of Regional Science*, *23*(2), 303–328.

Stockhammer, E. (2010). Financial market development and the global economy. *Political Economy Research Institute Working Paper*, *242*(40), 1–17.

Tiebout, C. M. (1956). A pure theory of local expenditures. *Journal of Political Economy*, *64*(5), 416–424. https://doi.org/10.1086/257839

Tsatsaronis, K., & Zhu, H. (2004). What drives housing prices dynamics: Cross-country evidence. *BIS Quarterly Review*, 65–78.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, *126*(1), 25–51. https://doi.org/10.1016/j.jeconom.2004.02.005

Wong, F. W., Chan, E. H., & Yu, A. T. (2011). Property developers' major cost concerns arising from planning regulations under a high land-price policy. *Journal of Urban Planning and Development*, *137*(2), 112–120. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000046

Wong, P., & Lin, M. C. Y. (2024). *Best-performing cities China 2023–2024: The nation's most successful economies*. https://milkeninstitute.org/sites/default/files/2024-08/BPCC2023-2024%20EN%20Final%20Report%20-%20Digital_0.pdf