



Examining the local government financial pressure on housing prices: evidence from China

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Abstract

The study examines the influence of local government financial pressure on average real estate sales prices. Annual data from the Chinese National Bureau of Statistics from 2000 to 2020 were analyzed based on the vector autoregressive model. Fixed asset investment and the growth rate of the population were included as moderators to analyze their moderating effects on the relationship between local government financial pressure and average real estate sales price. Local government fiscal pressure has a significant positive impact on the average real estate selling price, fixed asset investment, and population growth rate are negatively correlated with average real estate sales price. Therefore, this paper suggests reducing the fiscal revenue and expenditure gap faced by local governments, alleviating the financial pressure on local governments, increasing the proportion of residential land supply, and limiting the dependence of local governments on land finance, to restrain the price fluctuation of the real estate market.

Keywords: Fixed assets; growth rate; Housing price; investment; local fiscal pressure; population.

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1. Introduction

It is of great practical significance to examine the causes of housing prices comprehensively to enhance the understanding of the issue for formulating real estate regulation policies and promoting the healthy development of the real estate market. Existing literature has studied various factors affecting both housing demand and supply from multiple perspectives, among which economic fundamentals (Luo, 2014), real estate prices (Wang & He, 2015), income (Zhang, 2014) and population growth (Li et al., 2017; Hangli & Xinnan, 2024) are all used to explain the causes of China's high housing price. However, a very important influencing factor is seldom mentioned, that is, the study of governmental behavior or institutional factors under the specific national conditions of China. Some scholars point out that the high land price is driven by the land sales revenue of local governments, which is due to the financial plight of local governments under the current fiscal and tax system, namely the so-called "land finance" problem (Diao, 2015; Xia et al., 2023; Deng, 2022).

Based on the above empirical facts, this paper believes that local finance is an important perspective that cannot be ignored to explain the continuous rise of the current housing price. The existing literature on the discussion of local financial issues behind housing prices mainly focuses on the following two aspects: First, the influence of local government financial pressure and land finance. The research of Sun and Zhou (2013) and Huang and Cai (2013) reveals that the tax distribution system reform causes local governments to take land acquisition, development, and transfer as the main source of supporting local finance. Second, about the impact of land finance on housing price rise. Gong (2015) found that the land fiscal scale had a significant positive feedback effect on housing prices. Guo (2013) and Yuan et al., (2023) found that there is a mutual feedback mechanism between land fiscal dependence and local government fiscal gap, and both of them have a significant positive impact on housing prices. Li & He (2016) found that financial difficulties led to the dependence of local governments on land finance, and the dependence of local governments on land transfer fees was significantly positively correlated with the rise of housing prices.

To sum up, existing studies provide a broad perspective and valuable conclusions for understanding the relationship between housing prices and local government financial pressure. However, there are still some problems that need to be addressed. First, relevant literature does not fully identify the causal relationship between financial stress and housing price changes, and further research is needed. Second, most of the current research results appeared in the period of China's housing price rising from 2000 to 2015. However, after 2016, the government formulated policies to limit house purchases and loans, the heat of the real estate market gradually subsided, and the financial pressure on local governments increased accordingly. There is relatively little literature studying the influence of local government financial pressure on housing prices after 2016. Therefore, new studies are needed to fill this period.

1.1. Purpose of study

This paper studies the relationship between local government financial pressure and the average selling price of commercial housing through empirical analysis and discusses the effect of government behavior factors or institutional factors on the fluctuation of the real estate market under the institutional background of China's economic transition period. Through the research of this paper, it can provide

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corresponding empirical evidence for policy makers to some extent, to improve the overall social welfare level based on ensuring sustainable economic development.

1.2. Theoretical analysis and hypothesis

The study of the impact of local government financial pressure on housing prices mainly involves the following two aspects: First, the indirect impact of financial pressure on housing prices by promoting land price rise. Second, local governments have the direct motivation to maintain and promote the rise of local housing prices (Zhu & Xu, 2013). As the rise of housing prices will increase the profit expectation of real estate developers in the future, real estate developers will have enough motivation to "compete for land" by offering high prices, which will increase the land sales revenue of local governments (Zhang et al., 2024). The rise in housing prices objectively conforms to the financial interests of local governments, and local governments lack incentives to implement the national real estate regulation policy. Land finance has become an important financing channel for urban construction. In the face of the existing political performance assessment system and horizontal competition among regions, the main means adopted by local governments to promote the rapid growth of the local economy is to attract investment, which requires a good investment environment for large-scale urban construction by local governments (Zheng et al., 2014).

Real estate has become an important industry driving local economic growth. In the face of the GDP performance assessment mechanism, local governments have internal motivation to maintain and promote the rise of local housing prices (Zhu & Xu, 2013). As a result, local governments will even take active measures to stimulate housing demand and boost prices. In addition, local governments also pledge their land reserves to banks to make up the gap in government revenue and expenditure, but the premise of obtaining high financing conditions is land must have a high market value, which would lead to the local government pushing prices higher. Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 1: Local government financial pressure has a significant positive impact on housing prices.

Investment in fixed assets refers to the economic activities of building and purchasing fixed assets. The scale of investment in fixed assets can effectively measure the implementation of fiscal policies and fiscal revenue and expenditure of local governments. Based on the equilibrium relationship between the supply side and the demand side, the influence of market supply and demand on housing prices is analyzed. Based on the land spatial allocation policy, Han and Lu (2018) pointed out that the spatial mismatch between land supply and demand is the root of housing price differentiation among different cities. The supply of the real estate market increases when fixed asset investment increases, which has a restraining effect on housing prices. Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 2a: Fixed asset investment is negatively correlated with housing prices;

Hypothesis 2b: Local government financial pressure can produce a moderating effect on housing prices through fixed asset investment.

When the population growth rate decreases, the proportion of children dependent population decreases, and the proportion of the elderly dependent population increases. It should be pointed out that China's real estate is a special case, the demand and pressure of the young population to buy a house are directly transferred to their parents. Xu et al., (2012) showed that the increase in the old-age dependency ratio could promote the rise of housing prices, and believed that one of the main reasons for this situation was that the phenomenon of fewer children in families strengthened the motivation of parents to buy houses for their children. Based on the life cycle theory, Chen et al., (2013) found that the

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decline of the child dependency ratio and the increase of the elderly dependency ratio were demographic factors that caused the continuous rise of China's housing prices. Zou et al., (2015) found that the rising proportion of the elderly population in China has a positive effect on housing prices at present, and whether the aging process will restrain the rise of housing prices in the future depends on the ability of young people to realize housing demand. As the population growth rate decreases, the proportion of dependent elderly increases, and the expenditure of local governments on pensions and medical care increases, which puts pressure on local government finances. Local governments will be forced to raise land prices to obtain more income from land finance and relieve the pressure of public expenditure after the increase in the population dependency ratio. Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 3a: Population growth rate is negatively correlated with housing price;

Hypothesis 3b: Local government financial pressure can produce a moderating effect on housing prices through population growth rate.

2. Methods and materials

2.1. Variable selection

2.1.1. Dependent variable

The dependent variable is the average selling price of commercial housing. Real estate price is the main variable affecting real estate sales and land prices, so it is directly related to the financial pressure of the local government.

2.1.2. Independent variable

The independent variable is the financial pressure on local governments. Fiscal pressure mainly refers to the imbalance between fiscal expenditure and revenue of local governments, which is expressed by the fiscal revenue and expenditure gap.

2.1.3. Moderating variables

Fixed asset investment growth rate and the growth rate of the population are moderating variables. Investment in fixed assets is expressed in the monetary form in a certain period of the whole society to build and purchase fixed assets and related costs. The index is a comprehensive index reflecting the investment scale, structure, and development speed of fixed assets. Population growth rate is the ratio of the natural increase in population to the average population during a given period, expressed in thousandths of a percentage.

2.1.4. Control variables

Control variables are gross national income per capita and consumer price index. From the literature review of previous scholars' studies, we know that the factors affecting housing prices include economic development level, urbanization, price index, and other aspects besides the financial system. Therefore, this paper intends to select control variables from the above aspects. First of all, the change range of the average wage of employees is closely related to the development of the economy, so this paper will bring the average wage of employees into the control variable, to control the impact of economic development level on the housing price; CPI is closely related to the quality of life of residents, so this paper adopts the CPI to reflect the quality of life of urban residents, to control the impact of inflation on housing prices. To

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sum up, this paper adopts gross national income per capita and consumer price index as control variables. The definitions of variables in this paper are shown in Table 1.

Table 1
Variable definitions

| Variable | Variable Name | Abbreviation | Meaning and Measurement Method |
|----------------------|---------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Dependent variable | Average selling price of commercial housing | <i>Hprice</i> | Commercial housing sales/Commercial housing sales area |
| Independent variable | Financial pressure on local governments | <i>Fpre</i> | ln (local government budget expenditure - local government revenue) |
| Moderator variable | Fixed asset investment growth | <i>FAI</i> | (Current year's fixed asset investment scale - last year's fixed asset investment scale)/Last year's fixed asset investment scale×100% |
| | The growth rate of the population | <i>GP</i> | (Current year births - Current year deaths)/Annual average×1000‰ |
| Control variable | Gross national income per capita | <i>GNI</i> | Current year's per capita gross national income /Previous year's per capita gross national income×100% |
| | Consumer price index | <i>CPI</i> | Current year's consumer price index/Previous year's consumer price index×100% |

2.2. Model construction

Model 1 includes independent variable *Fpre*, moderator variable local government financial pressure *FAI*, population growth rate *GP*, and Control variable to verify hypothesis 1, hypothesis 2a, and hypothesis 3a. Model 1 can explore the impact of local government financial pressure on housing prices under the condition of controlling each variable. Model 2 introduces the interaction term *Fpre*×*FAI* of *Fpre* and *FAI* based on Model 1, to explore the moderating effect of local government financial pressure on housing prices through fixed asset investment and test hypothesis 2b. Model 3 introduces the interaction term *Fpre*×*GP* of *Fpre* and *GP* based on Model 1, to explore the mediating effect of local government financial pressure on housing prices through population growth rate and test hypothesis 3b. In this paper, *Hprice* is used as the explained variable, *Fpre*, *FAI*, and *GP* are used as explanatory variables, and *Control* is a set of control variables. The measurement model is established as follows:

$$\text{Model 1 : } Hprice_t = \alpha_0 + \beta_1 Fpre_t + \beta_2 FAI_t + \beta_3 GP_t + \beta_4 Control_t + \epsilon_t,$$

$$\text{Model 2 : } Hprice_t = \alpha_0 + \beta_1 Fpre_t + \beta_2 FAI_t + \beta_3 GP_t + \beta_4 Fpre_t \times FAI_t + \beta_5 Control_t + \epsilon_t,$$

$$\text{Model 3 : } Hprice_t = \alpha_0 + \beta_1 Fpre_t + \beta_2 FAI_t + \beta_3 GP_t + \beta_4 Fpre_t \times GP_t + \beta_5 Control_t + \epsilon_t.$$

Where α_0 is the intercept; $\beta_i (i=1,2,3,4)$ is the coefficient of each variable; t is the year, $t=2000, 2001, \dots, 2020$; $Hprice_t$ represents the average selling price of commercial housing in year t ; $Fpre_t$ represents the financial pressure on local governments in year t ; FAI_t represents the growth rate of fixed asset investment in year t ; GP_t represents the population growth rate in year t ; *Control* represents a group of control

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variables in the year t , namely, gross national income per capita GNI_t and price consumption index CPI_t ; ε_t is the random error term.

2.3. Sample selection and data sources

The marketization of China's housing system began in 1998. Considering the timeliness and availability of data, the sample interval was selected from 2000 to 2020. The data involved in the regression model are all from the website of the National Bureau of Statistics of China. A total of 126 valid sample data from 31 provinces, autonomous regions, and municipalities in China (excluding data from Hong Kong, Macao, and Taiwan) from 2000 to 2020 are obtained through the above calculation and processing. Data for this article can be accessed at the website of the National Bureau of Statistics of China: <http://www.stats.gov.cn/tjsj/ndsj/>.

2.4. Ethics

To reduce any possible risk of injury or discomfort to volunteers, the researchers implemented all necessary safety measures. The study's design and execution placed a high priority on ethical issues, with special emphasis on minimizing any negative consequences on the welfare of the participants.

3. Results

3.1. Correlation analysis

Correlation analysis was conducted for each variable, and the results are shown in Table 3. It can be seen from Table 3 that the correlation coefficient between the average selling price of commercial housing $Hprice$ and the financial pressure of local governments $Fpre$ reaches 0.963, which is significantly positively correlated at the 1% confidence level. The result shows that the greater the financial pressure of local governments is, the higher the average selling price of commercial housing will be, which preliminarily supports hypothesis 1. The average selling price of commercial housing is significantly negatively correlated with fixed asset investment growth FAI and growth rate of population GP at a 1% confidence level, with coefficients of -0.727 and -0.630 respectively. This result indicates that the growth rate of fixed asset investment and population growth have a restraining effect on housing prices, which preliminarily supports hypotheses 2a and 3a.

The variance inflation factor refers to the ratio of the variance between explanatory variables with multicollinearity and without multicollinearity. When $0 < VIF < 5$, there is no multicollinearity. When $VIF \geq 5$, it indicates that there is serious multicollinearity between explanatory variables. Table 3 shows that the VIF values of all variables are less than 5, which avoids the influence of multicollinearity on model regression results.

Table 2

Correlation test results

| Variable | $Hprice$ | $Fpre$ | FAI | GP | GNI | CPI |
|----------|----------|----------|---------|--------|-------|-------|
| $Hprice$ | 1 | | | | | |
| $Fpre$ | 0.963** | 1 | | | | |
| FAI | -0.727** | -0.567** | 1 | | | |
| GP | -0.630** | -0.545* | 0.352 | 1 | | |
| GNI | -0.711** | -0.613** | 0.770** | 0.394 | 1 | |
| CPI | 0.161 | 0.244 | 0.167 | -0.195 | 0.210 | 1 |
| VIF | | 2.432 | 2.584 | 1.461 | 3.104 | 1.409 |

Note: ** indicates a significant correlation at a 1% level (two-tailed), and * indicates a significant correlation at a 5% level (two-tailed).

3.2. Analysis of regression results

The regression analysis results of the relationship between variables are shown in Table 4. This paper adopts the term-by-term regression method to verify the relevant hypothesis. Column 1 only introduces control variables, column 2 introduces independent variable *Fpre* based on column 1. The regression results of column 2 show that the average sales price of commercial housing is positively correlated with the financial pressure of local governments at the significance level of 1%, and remains robust in subsequent columns. This shows that the financial pressure of local governments has an incentive effect on the average selling price of commercial housing, and the greater the financial pressure of the government, the higher the housing price. Hypothesis 1 is supported.

Table 3
Analysis of regression results

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|-----------------|---------------------|------------------|---------------------|------------------|------------------|----------------------|-----------------------|
| <i>Fire</i> | | 1,954.371 *** | 1,834.778 *** | 1,825.164 *** | 1,710.876 *** | 1,974.514 *** | 3,639.104 *** |
| | | (10.84) | (13.64) | (10.80) | (16.43) | (7.83) | (4.23) |
| <i>FAI</i> | | | -86.818 *** | | -85.583 *** | 102.951 | -54.228** |
| | | | (-4.02) | | (-5.38) | (0.62) | (-2.74) |
| <i>Fpre×FAI</i> | | | | | | -18.082 (-1.15) | |
| <i>GP</i> | | | | -238.497 ** | -231.844 *** | -177.718 ** | 2,719.208 * |
| | | | | (-2.37) | (-3.82) | (-2.32) | (2.08) |
| <i>Fpre×GP</i> | | | | | | | -268.311 ** |
| | | | | | | | (-2.25) |
| <i>GNI</i> | - 726.350** * | -177.342 ** | -28.780 | -155.394 ** | -9.557 | -18.141 | 87.084 |
| | (-5.15) | (-2.45) | (-0.45) | (-2.40) | (-0.20) | (-0.38) | (1.45) |
| <i>CPI</i> | 458.032 ** | -7.820 | 22.674 | -33.209 | -2.440 | 1.777 | -27.291 |
| | (2.15) | (-0.09) | (0.35) | (-0.42) | (-0.05) | (0.04) | (-0.62) |
| Constant | 36,912.22 9 | 5,290.388 | - 11,336.36 0 | 8,142.096 | -8,327.696 | - 10,956.86 5* | - 37,768.89 5** |
| | (1.55) | (0.58) | (-1.44) | (0.99) | (-1.43) | (-1.76) | (-2.69) |
| R-squared | 0.606 | 0.950 | 0.975 | 0.963 | 0.987 | 0.988 | 0.991 |
| F | 13.85 | 108.1 | 157.3 | 104.5 | 235.4 | 200.5 | 250.4 |

Note: Robust t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

The regression results of column 3 show that the relationship between the growth rate of fixed asset investment and the average selling price of commercial housing is significantly negative, with a coefficient of -86.818, which passes the significance test at the 1% level. Hypothesis 2a is supported. The regression results of column 4 show that the relationship between the growth rate of the population and the average selling price of commercial housing is significantly negative, with a coefficient of -238.497, which passes the significance test at the 5% level. Hypothesis 3a is supported.

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The positive and negative signs of the local government financial pressure coefficient do not change, and pass the significance test at the 1% level, which is consistent with hypothesis 1. In columns 1-5, the R-squared rises after adding a variable, which is consistent with hypothesis 2a and hypothesis 3a. In column 6, the interaction term $Fpre \times FAI$ of independent variable $Fpre$ and moderator variable FAI is introduced based on column 5. The correlation coefficient between $Fpre \times FAI$ and the average selling price of commercial housing is not significant, indicating that the financial pressure of local governments cannot produce a moderating effect on housing prices through fixed asset investment. Column 7 introduces $Fpre \times GP$, the interaction term of independent variable $Fpre$ and moderator variable GP , based on column 5. $Fpre \times GP$ is negatively correlated with the significance level of 5% of the average sales price of commercial housing, with a coefficient of -268.311. The coefficient of independent variable $Fpre$ also increased from 1,710.876 to 3,639.104, which shows that the financial pressure of local government can have a moderating effect on housing prices through the population growth rate. Hypothesis 3b is supported.

3.3. Stability test

To test the stability of regression results, this paper adopts the following two methods for stability test. First, considering that there may be a lag in local government fiscal pressure, the independent variable is changed to the gap of local government fiscal revenue of the previous year, that is, government fiscal pressure is regressed based on data from 1999 to 2019. The regression results show that the government financial pressure is still positively correlated with the average selling price of commercial housing at the significance level of 1%. Population growth rate still has a significant mediating effect between the average selling price of commercial housing and local government financial pressure. The second is to change the definition standard of variables and change the explained variables into the logarithm of the average sales price of commercial housing, and the empirical results show no substantial difference.

To further enhance the fitting of the above model and reduce the influence of the external environment on the experimental results, a heteroscedasticity test should be performed on Model 1 to test the existence of the random interference term. The result of White's heteroscedasticity test is as follows, $Obs * R\text{-squared} = 0.996725 < \chi^2_{0.05}(5) = 11.0705$, and $P(Obs * R\text{-squared}) = 0.9628 > 0.05$, thus, at the significant level of 5%, there is no heteroscedasticity in the model. If there is autocorrelation, the variance of the estimated parameters will be biased, and T-test will be meaningless. LM test was used to test the autocorrelation of Model 1. The result of the LM test is as follows, $LM = 0.004266 < \chi^2_{0.05}(2) = 5.991$, $P(Obs * R\text{-squared}) = 0.9979 > 0.05$, thus, at the significance level of 5%, there is no autocorrelation in the model.

4. Discussion

This paper attempts to reveal the impact of local government financial pressure on housing prices under the institutional background of China's economic transition period. Based on the time series data of the National Bureau of Statistics from 2000 to 2020, the empirical study finds that: Local government financial pressure has a significant positive impact on housing prices. Local governments' dependence on land finance will increase under financial pressure. Local governments hope to obtain a large amount of off-budget fiscal revenue by selling land, thus pushing up housing prices.

Therefore, local government financial pressure will lead to the rise of housing prices; Fixed asset investment and population growth are negatively correlated with housing prices; The financial pressure of local government can have a moderating effect on housing prices through the growth rate of population, thus weakening the positive influence of local government financial pressure on housing price.

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5. Conclusion

To coordinate the development of the real estate market with the financial pressure of the local government and ensure the local government obtains a stable source of income, this paper puts forward the following suggestions based on the above research results: reasonably determine the share of VAT tax revenue between the central and local governments, to maintain stability in local fiscal tax revenue. Investment in fixed assets needs to be increased. The government needs to appropriately increase the proportion of residential land supply, increase the supply of low-income housing, and curb the rapid rise of urban housing prices to accommodate more labor force moving into cities due to economic agglomeration.

The demographic dividend needs to be preserved. The government needs to make rational use of land fiscal revenue, increase the proportion of land fiscal expenditure on non-economic public services such as medical care, education, health, and indemnification housing, vigorously improve people's livelihood, reduce the living costs of residents, and increase the fertility rate. Incentives should be adopted to attract the influx of young people and reduce the dependency ratio of the elderly.

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