

An Empirical Study of the Impact of Land Finance on Housing Prices

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Abstract –In recent years, the real estate industry has got a stage of vigorous development. At the same time, accompanied by booming real estate market supply and demand situation is the rapid rise in property prices. Property prices is affecting not only ordinary people's lives and work, but also the country's macroeconomic trends closely. However, what is the role that local government has played during the housing prices is becoming higher? This article starts by describing the nature of land finance and its formation; analyze the government behavior with game theory models. Based on the data of Shandong province, I will make the empirical tests to do further analysis. Our findings show that the land transfers revenue has positive correlation with local real estate prices. In view of this result, I provide several policy recommendations including property tax levy and standardize the land transfer behavior of local government.

Keywords –housing prices, land transfer revenues, game theory models, empirical analysis

1. Introduction

Land finance refers to the phenomenon that local government relies on land transfer revenues to maintain the local fiscal expenditure. Broadly speaking, however, "Land finance" includes not only the direct revenue of transfer land, it also includes other indirect revenue from real estate, construction, as well as the tax when selling the land.

Under present assessment system, the economic indicators like GDP, fiscal and employment growth are got more attention when evaluating the performance of local government. And, the quality of the completion of these indicators is closely related to the development of real estate. That is, in order to get good performance evaluation, the real estate

development must be considered by local government. Due to these reasons, the local government's dependence on land financial grows with each passing day.

David E. Dowall, John D. Landis, Evans and Kin Jeongho (1982) use the data of San Francisco and find that the price of new housing system will influenced by local land density control policies and effective utilization of land, and hold that the main factor to promote house price is High land price and land supply planning. It is crucial for us to understand the dynamic relationship between housing and land markets, as this interaction is a key factor in the residual valuation method for land value appraisal widely used by house developers (Somerville, 1996; Tse, 1998).

Glaeser and Gyourko (2003) find many local housing prices have been close to the cost of construction, even in some parts below the cost. However, In some areas where house prices are high, the land prices are relatively inexpensive, and they conclude that High House prices are actually lead by the land planning or land control of local government.

Kim, Park, Shilling, and Cho (2008) find a bidirectional causality relationship between housing prices and land values in the U.S. market. Note that in these studies, the issue is examined under the same land policy and in the same market environment. Hongqian, Deng (2003),in his book 《The financial problem research of China city—the real estate tax and city land rent》,preliminary discussed various places of our country which make land transfer income as the main non tax income plan ,that is the unique "land finance " phenomenon. This Chinese peculiar phenomenon has its realistic source: Our government finance income had relatively substantially growth after the implementation of distribution of tax system in 1994, but the prefecture-level municipal finance has become increasingly difficult. The reason of this problem could divide into factors as follows: intergovernmental division of powers is unclear, the right of local tax is highly concentrated in the central government, and tax distribution system has not been established and so on.

Shouying, Liu and Xinsan, Jiang (2005) find the phenomenon that developed local government’s budgets rely on higher taxes brought by urban expansion, while extra budgetary rely on land revenues. They believe that land has become the boosters of industrialization and urbanization of our country. On one hand, land has been an important source of local fiscal revenue; on the other hand, the land became a important tool to provoke the Bank funding, investment and financing of urban infrastructure and real estate. Lifeng, Liu (2010) believes that the land finance that a key position in local financing mode. Xuejun, Du(2009) finds the land finance improve the enthusiasm of local government, increase the local government revenue, as well as the investment in fixed assets using data of 30 provinces from 1998—2005, so , land finance has a significant positive impact on economic growth. Xin Bo (2010)

holds that land financial has a huge impact on the local economy at investment, expanded investment, infrastructure improvement, and development in other industries etc. He also finds economic growth is the result of land finance by using Granger causality test. and the measurement methods and models are referred to the way that Yudong Zhang, and Lenan Wu (2009, 2011) used in their paper when analyzing the relationship between stock and S&P 500 .These studies all show that local governments have benefit a lot from land finance.

Shuangzhang, Li and Daokun, Zhang(2010) use data of 35 cities to do empirical tests to analyze the effect of land transfer revenues on house price, finding that land transfer revenue have positive correlation with local real estate prices.

2. Methodology

In this paper I will use game theory model to analysis the behavior of local government, when facing the house price regulation from central government.

The central government take action to control house price, local government has two choices: Obey or disobey, while the central government also has two choices: monitoring or neglect. Due to asymmetric information between local and Central Government, the central government need to pay the cost of supervision in order to identify whether the local government carry out the policy. In this paper, I will use a mixed strategy Nash equilibrium as follows to describe the game between local and Central government.

Table 1 Game Model analysis

| | | Local government | |
|---------------------|---------|------------------|-----------------|
| | | Obey | Disobey |
| Central government. | Monitor | A1−C−E, R1+E | A2−C+F, R2−F |
| | Neglect | A1, R1 | A2, R2 |

Notes:

Suppose under no supervision from the central government, the income the local government get by

cooperating with the central government regulation policy will be R_1 , otherwise, the income will be R_2 , apparently $R_2 > R_1$. The income of central government revenue will be A_1 , if local government cooperates with the central government regulation and control policy, otherwise, the income will be A_2 . The cost of central government's supervision is C . The local government which will cooperate with executive regulation policy from central government will get E for reward, otherwise, it will get F for punishment.

The income if local government chooses not to cooperate with central government's regulation policy ($\gamma=1$) will be:

$$L(\theta,1) = (R_2 - F)\theta + R_2(1 - \theta)$$

While, the income if local government chooses to cooperate ($\gamma=0$) will be:

$$L(\theta,0) = (R_1 + E)\theta + R_1(1 - \theta)$$

$$L(\theta,1) = L(\theta,0)$$

$$\theta^* = \frac{R_2 - R_1}{E + F}$$

Local governments will tend not to meet the central government's control policy, if the probability that supervision taken by the central is less than $\frac{R_2 - R_1}{E + F}$; instead, if the probability is higher than $\frac{R_2 - R_1}{E + F}$, the local government will cooperate with the central government.

Then we know, the probability that central government take supervision will be reduced with the cost becomes high. According to the present situation in China, the supervision cost is still very high, what's more important, unobstructed monitoring mechanisms and favorable binding measures are failed to establish till now, which makes the central government more inclined to take no supervision. Meanwhile, the economic meaning of $R_2 - R_1$ is the difference of interest between the local government's two choices: obey or disobey. In conclusion, local governments will definitely choose to disobey, in the case of no supervision from central government, to gain more

economic interests.

3. Empirical Model Specification

3.1. Main Variables and Data Sources

In this paper we consider evidence from Shandong. Shandong is a populous and developed province in China and plays an important role in the Chinese economy. In particular, the real estate markets in is a more mature markets

3.1.1 Annual average housing prices (PR)

PR represents the average housing sales price of per square meter of Shandong province, which is calculated by dividing housing sales amount by the actual housing sales area. The data was retrieved from the Shandong Statistical Yearbook and Yearbook of China real estate market.

3.1.2 Gross Domestic Product (GDP) of Shandong province

GDP refers to in the period of time (a quarter or a year), a production out of the country's or region's economic value of all final goods and services, which is often recognized as the best indicator of the state of the economy. Not only does it reflect a country's economic performance, but also reflect a country's national strength and wealth.

3.1.3 The per capita disposable income (GZ)

The data was retrieved from the Shandong Statistical Yearbook

3.1.4 Land fiscal dependency (CZ)

Land fiscal dependence could be expressed as the ratio of land transfer income and revenue. According to the above analysis, if this ratio is high, means the degree that local government relies on land finance is high. Thus the local government will try to push the price, if the local government's action does impact on house prices, then the coefficient of this variable

should be positive.

$$PR = \delta + \alpha \ln GDP + \beta \ln CZ + \lambda \ln GZ + \theta \ln FS$$

3.1.5 Land transfer revenues (FS)

The data was retrieved from the Shandong Statistical Yearbook

3.2 Model Specification

According to the above analysis and research experience of the existing literature, this article will assume the function of housing prices as follows:

Then this paper will employ the co-integration analysis and Granger causality test in an error correction framework to detect the long- and short-term dynamic relationships between dependent variable and independent variables. The algorithm and model construction methods which used by Yudong Zhang, Lenan Wucan (2012) in their papers could provide a train of thought to improve the measurement analysis of this paper.

Table2. Summary statistics.

| | Annual average housing prices (PR) Unit: Yuan / m ² | GDP (Shandong) (Unit: CNY one hundred million) | The per capita disposable income (GZ) Unit: Yuan / year | revenue (Unit: CNY one hundred million) | land fiscal dependency (CZ) | land transfer revenues (FS) (Unit: CNY one hundred million) |
|------|--|--|---|---|------------------------------------|---|
| 1997 | 1343.99 | 6537.07 | 5190.79 | 304.42 | 4% | 11.65 |
| 1998 | 1319.7 | 7021.35 | 5380.08 | 352.39 | 4% | 13.98 |
| 1999 | 1344.25 | 7493.84 | 5808.96 | 404.48 | 3% | 12.49 |
| 2000 | 1426.98 | 8337.47 | 6489.97 | 463.68 | 5% | 22.87 |
| 2001 | 1456.95 | 9195.04 | 7101.08 | 573.18 | 7% | 37.67 |
| 2002 | 1604.76 | 10275.50 | 7614.5 | 610.22 | 29% | 178.34 |
| 2003 | 1698.29 | 12078.15 | 8399.91 | 713.79 | 56% | 400.24 |
| 2004 | 2405.29 | 15021.84 | 9437.8 | 828.33 | 54% | 448.84 |
| 2005 | 2865.82 | 18516.87 | 10744.79 | 1073.13 | 46% | 498.59 |
| 2006 | 3436.86 | 22077.36 | 12192.24 | 1356.25 | 52% | 702.11 |
| 2007 | 3087.56 | 25965.91 | 14264.7 | 1675.40 | 51% | 847.41 |
| 2008 | 3567.23 | 31072.06 | 16305.41 | 1957.05 | 47% | 926.431 |
| 2009 | 3798.33 | 33805.3 | 17811.04 | 2198.63 | 43% | 955.08 |
| 2010 | 3946.08 | 39416.2 | 19945.83 | 2749.38 | 35% | 960.45 |

4. Empirical Analysis

4.1. Stationarity and co-integration tests

When using time series model, the data series for all economic variables should be stable. So, we conduct unit-root tests on both the level and the first differenced series to check the stationarity of all variables.

The results for the tests are reported in Table 3, which indicate that the level series for all variables are nonstationary, while the first differences of all series are stationary. Hence, all price series are indeed I(1) series. We then test whether they are co-integrated and have a long-run dynamic relationship. Using Johanson co-integration test and the results demonstrate that all variables are co-integrated

Table 3 unit-root tests

| | | | | | |
|------|--------------------|-----------|----|-----------------|---------|
| InPR | ADF Test Statistic | -5.831381 | 1% | Critical Value* | -4.2207 |
|------|--------------------|-----------|----|-----------------|---------|

| | | | | | |
|-------|--------------------|-----------|-----|-----------------|---------|
| | | | 5% | Critical Value | -3.1801 |
| | | | 10% | Critical Value | -2.7349 |
| lnGDP | ADF Test Statistic | -3.671372 | 1% | Critical Value* | -3.2207 |
| | | | 5% | Critical Value | -3.1801 |
| | | | 10% | Critical Value | -2.7349 |
| lnCZ | ADF Test Statistic | -4.997360 | 1% | Critical Value* | -4.2207 |
| | | | 5% | Critical Value | -3.1801 |
| | | | 10% | Critical Value | -2.7349 |
| lnFS | ADF Test Statistic | -4.882635 | 1% | Critical Value* | -4.2207 |
| | | | 5% | Critical Value | -3.1801 |
| | | | 10% | Critical Value | -2.7349 |
| lnGZ | ADF Test Statistic | -7.110442 | 1% | Critical Value* | -4.2207 |
| | | | 5% | Critical Value | -3.1801 |
| | | | 10% | Critical Value | -2.7349 |

4.2. Granger Causality Test

Through co-integration test, there does exist a long-term relationship between these Variables, but does not

indicate a causal relationship between these.

Granger causality test used in this article can reflect the causality.

Table 4. Granger causality test

| Null Hypothesis | F-statistics | Significance Probability | Conclusion |
|--------------------------------------|--------------|--------------------------|------------|
| lnPR does not Granger Cause lnGDP | 6.21259 | 0.03352 | Refuse |
| lnGDP does not Granger Cause lnPR | 6.81961 | 0.02272 | Refuse |
| lnGZ does not Granger Cause lnPR | 1.38453 | 0.31143 | Accept |
| lnPR does not Granger Cause lnGZ | 1.91495 | 0.21710 | Accept |
| lnPR does not Granger Cause lnFS | 0.03859 | 0.96235 | Accept |
| lnFS does not Granger Cause lnPR | 26.3952 | 0.00155 | Refuse |
| lnPR does not Granger Cause lnCZ | 8.02258 | 0.04775 | Refuse |
| lnCZ does not Granger Cause lnPR | 13.1110 | 0.00429 | Refuse |

We concluded from the test that GDP, land fiscal dependency (CZ), land transfer revenues (FS) are the reasons of Annual average housing prices (PR), while the per capita disposable income (GZ) is not the reason of Annual average housing prices (PR), so we

could abandon this variable.

4.3 Model analysis

Based on the analysis above and measurement

results, we get regression analysis using Least squares method.

Table 5. Regression analysis

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| C | 7.8684 | 0.2205 | 8.814863 | 0.0029 |
| GDP | 0.34082 | 0.042553 | 13.330933 | 0.0483 |
| FS | 0.957860 | 0.977360 | 8.665929 | 0.0301 |
| CZ | 0.563287 | 0.742258 | 3.518197 | 0.0333 |

$$pr = 0.3482gdp + 0.9578fs + 0.5632gz + 7.8684$$

We can see that the P-value of T-statistic of constant and variable's coefficient are less than 5%, which are able to pass the significance test; The value of F-statistic is 69.298, and its P-value is less than 1% which can also pass the significance test. R-squared is 0.944275, and adjusted R-squared is 0.94173, indicating a better fit of the regression equation to the data.

Evidence shows that the GDP, land fiscal dependency and local fiscal revenue are positively correlated with house price, which is in line with the day-to-day economic laws. At the same time, the price elasticity to local fiscal revenue was 0.056, indicating that local government's land fiscal dependency increased 1%, China's commercial housing prices rising 0.056%

5. Conclusions and Policy Suggestions

Base on the analysis above, we can draw a conclusion that the land finance has great effect on house prices. Several measures could be taken to solve this problem:

5.1 The implementation of property tax, instead of land transfer revenues

Property tax-based property tax should be able to become the most important tax and financial resources of local government. Firstly, the property tax levy tax is in accord with the interests' principle, which will enhance the value of local real estate fundamentally, meanwhile, the property owner who is the beneficiary of both value-added housing and public services, is also required to pay the appropriate

costs in the enjoyment of local government public services. Secondly, to some extent, there is a certain connection between the income of property tax and the situation of local economic development, the real estate tax amount varies with the level of economic development and increased year by year.

The property tax levy for the local government will expand the financial resources, thereby reducing the dependence of the "land finance". Once the local government's disposable income increases, the incentive factors of blind development, "land", "enclosure" will also no longer evident, that will reduce the local government for their own interests and the blind development of land acts.

Finally, for real estate speculators, property tax levy to improve the costs and risks of real estate speculators fundamentally, the rising cost of virtually compress the huge profits of the real estate acts, bound to its accumulation of housing, pushing up house prices behavior dealt a blow.

5.2 The Standardization of the land transfer

To solve the various problems caused by the land finance, what is most fundamental and critical is to change the land monopoly of local government. First, the central government should control land of various categories strictly, not only to control the scale, but also the nature of land. As for the hot development zones arisen in many districts, central government should be strict at examination and approval.

Second, the relationship between urban land and rural land should be handled properly; the central government should consider releasing the rural collective land slowly to promote them to enter the

land market and participate in competition, rather than keep dual economic structure forever. This allows farmers to obtain the benefits from markets, meanwhile, make full use of all resources. In line with the principle of market competition; we can let the land of city into higher-value areas to participate in the competition. Finally, we should safeguard the rights of farmers to use and circulate land reasonably, and stop the land violation from the local government or the rural collective to ensure the interests of farmers.

5.3 The change of the binary state of the land, the implementation of land circulation.

The farmers could participate in economic construction not only as a workforce, but also as the owner of the land. The local government should make clear its land reserve liability, as well as the scope of the explicit reserve land, the farmers' land can not be included in the scope of reserve levy, in addition, local government should reduce the investment capital of the construction of development zones and infrastructure.

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