Dilemma of Chinese Real Estate Tax Reform: Based on Evolutionary Game Method

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Abstract. High housing price is a great agitation for contemporary Chinese people, therefore, many Chinese, especially Chinese youths, would like to see a more stable real estate industry. As a device for government to guarantee the real estate industry progress healthily, real estate tax has been being unfortunately difficult to expand thoroughly in China due to local governments' financial problems. The research target of this paper focuses on Chinese central and local governments and real estate company faced with real estate tax reform. With evolutionary game model, the authors conclude that the major obstacle of the reform in China is land-transferring fees. The breakthrough points in problem of spreading real estate tax could be increasing its comprehensive benefits. The reform could only be done effectively after that the vertical governments work with each other voluntarily, so this paper suggests that the central government should give full assistance to local governments in formulating property tax plans and should promote the position of property tax as the main local income tax to make up for the financial defects after substituting business tax with value-added tax.

Keywords: Evolutionary Game Theory; Macroeconomic Regulation; Real Estate Tax Reform.

1. Introduction

The public pay more and more attention to the real estate. As Chinese economic is developing faster and faster, thousands of people flood into the market of real estate, making the society more and more concerned about real estate. Nowadays having a house has gradually become the main part of a family's property. However, the negative effects of real estate cannot be ignored. The unreasonable real estate tax system cannot fully use the function of tax regulation, resulting in unreasonable distribution of wealth. With more and more debates about real estate, in December 2021, the central government stressed that it is necessary to "deeply promote the reform of taxation system" and "prepare for the real estate tax pilots". There is no denying that the implementation of the real estate tax will become an imperative measure in China's future. It aims to better handle the problems faced by China's real estate market. Nowadays, a lot of aspects of the real estate have been studied by many researchers, such as the price of the estate, the supply chains of the houses. Based on these, experts have given some suggestions to real estates' market.

The essay focus on the real estate tax that is being piloted in some cities in China at present, trying to establish a model and then give advice to central government, local government and real estate companies through game theory. This research will regard them as the three main bodies, and then use a model to build a three-way game to analyze what will happen after the implementation of the tax. In conclusion, it is advised that the benefits brought to local government should be improved as much as possible so that better implement of the real estate tax will be possible. In order to better achieve this goal, it is suggested that the central government can actively work with local government

to formulate specific regulations and implementation plans for real estate tax. Therefore, establishing a sustainable financial system is achievable.

2. Literature Review

2.1 Study on Differences of Objectives Between Governments

The Central Committee of the Communist Party of China emphasized that "Reform of the fiscal system and the taxation system shall be promoted deeply", "prepare for the real estate tax pilot" in National Financial Work Conference held in December, 2021. This made the call for the reform become a climax again. Although the governments at both levels take the improvement of social welfare as the macro object, there are still differences in micro objectives between them: The central government promotes real estate tax reform to help local governments establish a sustainable tax system. The collection of tax could curb the real estate market not to generate too many bubbles, too. But the local officials who are entrusted to complete the policies prefer that the current local fiscal system bound with land-transferring fees could be maintained because it belongs to the extra budgetary revenue.

FuQiang Zhang (2015) pointed out that the central government and local governments were inconsistent about their micro objectives. The local governments would resist real estate tax reform because improving the new tax system would cost a lot and its time span would be long. Compared with the land -transferring fees as extra budgetary revenue, the real estate tax as budgetary revenue would weaken the authority to dispose with the income independently of local governments, hence the collection of tax would lead to a decline in their comprehensive revenue [1]. HaiYan Qian (2020) focused on the effects real estate tax reform would lead to local financial system mainly relying on granting lands. She said that revenue from granting lands was severe limitation to the reform. The local fiscal revenue excessively depends on land finance caused by imbalance of financial resources and powers between central and local governments [2]. These two documents explain distinctly why real estate reform has never been effectively promoted in the past decades.

2.2 Study on Effects of Real Estate Tax Reform

Chinese government has not yet imposed tax on real estate ownership generally. After the reform, real estate tax will raise a profound effect on social economy. Chinese scholars have explored and analyzed these impacts in many ways. For the comprehensive benefits of real estate tax, the scholars often use the financial data of Shanghai and Chongqing, which have been piloted for a long time, to conduct research. In addition, due to the richer experiences of the implementation of real estate tax in OECD countries, its effects were also expounded by referring to these experiences.

Study on Effects of Real Estate Tax Reform on Local Fiscal System. ShaoQin Sun (2018) analyzed the economic effects of real estate tax levied in Shanghai and Chongqing through DID method, and concluded that its impact on local government income was directly related to tax rate and housing price fluctuation. Housing prices would be restrained, but inhibitory effect would be less than the increase bringing to the local government income [3]. PengJie Xu (2020) used Synthetic Control Method based on panel data of 35 cities, to analyze what kind of effects the tax has been bringing to land finance since 2011. He demonstrated that real estate tax would not only reduce the enterprises' costs of land through diminishing housing prices, but also guide enterprises to invest in other industries, which could reduce the crowding-out effect of real estate industry, and lower the threshold of the credit funds for other industries. The dependence of local fiscal system on land finance would be weakened from these aspects [4]. Yan Huang (2020) suggested that real estate tax would reduce the dependence of local governments on land transfer. The tax would reduce land price, weaken the expectation of real estate appreciation from inhabitants. It could guide inhabitants to tend to deposit, then the investment to production department would grow, and it would finally increase total social output [5].

Study on the Economic and Social Benefits of Real Estate Tax Reform. YaPing Yang (2017) suggested that the economic benefits of real estate tax included the optimization of the tax system which would enhance tax collection to be more convenient, and the improvement of land finance. The tax could also contribute to regulation of income distribution, curbing the excessively rising housing prices, preventing the bubble in the real estate industry from bursting [6]. KeYuan Zheng (2017) compared the fluctuation of housing prices after the pilot project with the normal level, and concluded that the pilot policies had not taken effect in the long term and short term. This could be attributed to the unclear orientation, small size, narrow collection scope and low tax rate. But the scholar affirmed the stability, growth and relative independence of real estate tax. Add the efficient collection and management of local governments, the real estate tax could become a reliable source of fiscal income [7]. WanLing Zhang (2019) selected the real estate tax pilot in Shanghai and Chongqing as the research objects. After comparing with data in two cities, the scholar pointed out that the purpose of taxation in Shanghai was to curb investment demand, and that in Chongqing was to regulate income distribution. According to data analysis, Shanghai and Chongqing's real estate tax collection had adjusted the investment preference of real estate enterprises from supply side. The growth rates of investment in two cities have declined year by year, illustrating the inhibiting effect of real estate tax on excessive supply of commercial housing to a certain extent [8]. BenGui Li (2021) made a comprehensive analysis of the functions of real estate tax, including increasing local fiscal revenue, promoting tax fairness, and improving tax system [9]. Wei Liu (2021) Drew on the general experience of OECD governments in implementing real estate tax. The scholar pointed out that the proportion of real estate tax revenue to gross tax revenue elevated higher in 2009 when the financial crisis led to economic downturn, which indicated that real estate tax had played a stabilizing role in the overall tax revenue [10].

From the above literature, it is clear to see that the study on benefits of real estate tax has been discussed well. This paper integrates these effects into parameters, establishes evolutionary game model to make analysis of the resistance to the spread of real estate tax reform in China. Since scholars have relatively less researches on the evolutionary game of real estate tax reform, this paper has its own research value.

It has been 11 years since the State Council approved the pilot project of real estate tax in 2011, but it is still difficult to promote it nationwide nowadays. Real estate tax reform can affect the balance between government and industry, because it is believed that, when real estate tax is put into formal use, the land granting revenues will decrease, which can shake the core of local fiscal system. Subsequent experimental analysis will focus on two questions: “How the interests of governments and real estate Company’s change will before and after the reform”, “Where is breakthrough for local governments to cooperate with the reform”. Relevant suggestions are based on the conclusion of evolutionary game.

3. Model Analysis

In terms of research methods, considering the fact that it is difficult to achieve the complete rationality of the game players and the information asymmetry in reality, the choice of strategies is often the result of the evolution of the potential relationship between the parties. The reason for choosing evolutionary game is that, the result of evolutionary game is the final Nash equilibrium point under corresponding conditions and the final result of macro-control. Therefore, it is more realistic to explore the game problem of real estate tax reform based on limited rationality, and the evolutionary game can also more intuitively reflect various evolutionary relationships under the uncertainty of parameters.

In the evolutionary game method, the geometric intuitive expression of mathematical formulas can be used to make the problem more intuitive. When there are many parameters and uncertainties, the evolutionary game theory can give results more efficiently, and reflect the impact of various variables on the overall.

3.1 Game Relationship

Figure 1 shows the game relationship between the central government, local governments and real estate companies

Fig 1. Schematic diagram of game relationship.

First of all, the central government is the leader of this reform, and the real estate tax reform is aimed at developing the alienated real estate market. As shown in this figure, the central government "instructs policies and rectifies the industry" for real estate companies. To local governments, a "principal-agent" relationship has been formed between the two in policy implementation - local governments are responsible for formulating specific plans to achieve the central regulatory objectives, and the central government is constrained by the information asymmetry between vertical governments, playing more of the role of "supervising implementation and assisting reform".

Secondly, real estate companies and local governments are the recipients and executors of this reform. After the impact of the real estate tax reform, the real estate company will inevitably adjust according to the actual situation and policy provisions, enterprise adjustment and market response, which will affect the local fiscal revenue. Therefore, the local government must judge the comprehensive profit and loss of local finance brought by the reform, which has both social and economic benefits.

3.2 Parameter setting

In parameter setting, there are both common interests of the three parties and specific interests.

Table 1. Table of Game Model Parameters.

Parameters	Parameters meaning
A_i	Comprehensive benefits brought by the successful implementation of the real estate tax reform. $A_1$is benefits to local governments, A_2 is to real estate companies, and A_3 is to the central government
B_i	Execution cost of each party, $B_1$is investigation costs for the central government, B_2 is implement costs for local government policies.
C_i	Local government revenue.$C_1$is the financial revenue of local governments before the reform,$C_2$is the financial revenue of the local government after the reform.
E_i	The impact of local governments' failure to implement policies on all participants.$E_1$is the impact on the local government,$E_2$is the impact on the real estate companies, $E_3$is the impact on the central government. Positive values are positive effects and negative values are malignant effects.
F	Penalties imposed by the central government on local governments for not implementing policies.
G_i	The impact of real estate developers' lowering house prices.$G_1$is the impact on local governments,$G_2$is the impact on the real estate company, $G_3$is the impact on the central government. Positive value is positive effect, negative value is malignant effect
J_i	The impact of real estate developers' supply reduction. $J_1$is the impact on the local government, $J_2$is the impact on the real estate company, $J_3$is the impact on the central government. Positive values are positive effects and negative values are malignant effects.
R	The positive benefits obtained after the central government punishes local governments.

Table 1 shows the specific meanings of the parameters in the model. Therefore, if the local government does implement the reform policy, it will gain benefits$A_1 + C_2$and bear costsB_2. At the same time, when the real estate company decides to reduce the house price, the cost of the local government will rise to$B_2 + G_1$, and when the real estate company decides to reduce the supply, the benefit of the local government will rise to$A_1 + C_2 + J_1$; If the local government does not implement the reform policy, it will gain benefit C_1 and bear the costE_1. At the same time, when the real estate company decides to reduce the house price, the cost of the local government will rise to$E_1 + G_1$. When the real estate company decides to reduce the supply, the benefit of the local government will rise to$C_1 + J_1$. If the central government chooses to investigate, the local government will also pay additional costs (the cost of punishment).

3.3 Tripartite game income matrix

According to the game income matrix in Table 2, the benefit of local governments, real estate companies and the central government under the background of real estate tax reform is not only affected by their own behavior strategies, but also affected by the behavior strategies of other partners. Each participant has to consider the other's behavior

Table 2. Game strategy selection and income matrix of central government, local government and real estate companies.

local government	real estate companies	central government	
		without investigation *z*	Investigation 1-*z*
Implementing policies *x*	Lower house prices *y*	$A_1 - B_1 + C_2 - G_1$ $A_2 - G_2$ $A_3 + G_3$	$A_1 - B_1 + C_2 - G_1$ $A_2 - G_2$ $A_3 - B_3 + G_3$
	Reduce supply 1- *y*	$A_1 - B_1 + C_2 + J_1$ $A_2 - J_2$ $A_3 - J_3$	$A_1 - B_1 + C_2 + J_1$ $A_2 - J_2$ $A_3 - B_3 - J_3$
Implementing policies 1 - *x*	Lower house prices *y*	$C_1 - E_1 - G_1$ $E_2 - G_2$ $-E_3 + G_3$	$C_1 - E_1 - F - G_1$ $E_2 - G_2$ $-E_3 + G_3 - B_3 + R$
	Reduce supply 1- *y*	$C_1 - E_1 + J_1$ $E_2 - J_2$ $-E_3 - J_3$	$C_1 - E_1 - F + J_1$ $E_2 - J_2$ $-E_3 - J_3 - B_3 + R$

3.4 Solutions of Evolutionary Stability Strategy

Game Equilibrium Analysis of Local Government. According to Table 2, the expected benefit of the "policy implementation" strategy U_{A1}, the "policy non-implementation" strategy U_{A2} and the overall average expected benefit of the local government $\overline{U}_A$ are:

$$U_{A1} = yz(A_1 - B_1 + C_2 - G_1) + z(1-y)(A_1 - B_1 + C_2 + J_1) + y(1-z)(A_1 - B_1 + C_2 - G_1) + (1-y)(1-z)\ (A_1 - B_1 + C_2 + J_1) \tag{1}$$

$$U_{A2} = yz(C_1 - E_1 - G_1) + z(1-y)(C_1 - E_1 + J_1) + y(1-z)(C_1 - E_1 - F - G_1) + (1-y)(1-z)(C_1 - E_1 - F + J_1) \tag{2}$$

$$\overline{U}_A = xU_{A1} + (1-x)U_{A2} \tag{3}$$

The replicator dynamics equation of local government is:

$$F(x) = \frac{dx}{dt} = x(1-x)(A_1 - B_1 - C_1 + C_2 + E_1 + F - Fz) \tag{4}$$

For the convenience of discussion, let:

$$Z_0 = \frac{A_1 - B_1 - C_1 + C_2 + E_1 + F}{F} \tag{5}$$

If $z = z_0$, then $F(x) = 0$, it means that all levels are stable, that is, no matter what the initial proportion of "implementing policy" and "not implementing policy" strategies the local government chooses, the proportion will not change over time.

If $z \neq z_0$, let $F(x) = 0$, the two stable points are $x = 0, x = 1$.

The derivative of $F(x)$ is:

$$F'(x) = (1-2x)(A_1 - B_1 - C_1 + C_2 + E_1 + F - FZ) \tag{6}$$

Evolutionary Stability Strategy (ESS) requires $F'(x) < 0$, the following two situations:

If $z > z_0, F'(x)|_{x=0} < 0, F'(x)|_{x=1} > 0, x = 0$ is stable, the local government chooses not implementing the policy as an ESS.

(b) If $z < z_0, F'(x)|_{x=0} > 0, F'(x)|_{x=1} < 0, x = 1$ is stablr, the local government chooses implementing the policy as an ESS.

The dynamic evolution of local government is shown in the figure 2:

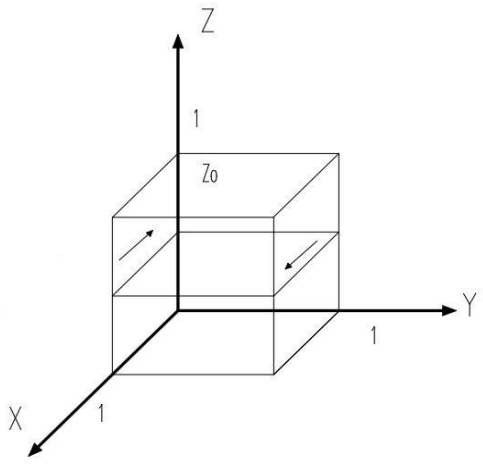

Fig 2. The dynamic evolution of local government.

Note: in 3D geometric space, in a cube, the upper and lower evolution directions of the segmentation surface are 1 and 0 respectively.

Game Equilibrium Analysis of Real Estate Companies. According to Table 2, the expected benefit of the "Lower house prices" strategy U_{B1}, the "Reduce supply" strategy $U_{B2}$and the overall average expected benefit of real estate companies $\overline{U}_B$are:

$$U_{B1} = xz(A_2 - G_2) + z(1-x)(E_2 - G_2) + x(1-z)(E_2 - G_2) + (1-x)(1-z)(E_2 - G_2) \tag{7}$$

$$U_{B1} = xz(A_2 - J_2) + z(1-x)(E_2 - J_2) + x(1-z)(A_2 - J_2) + (1-x)(1-z)(E_2 - J_2) \tag{8}$$

$$\overline{U}_B = yU_{B1} + (1-y)U_{B2} \tag{9}$$

The replicator dynamics equation of real estate companies:

$$F(y) = \frac{dy}{dt} = y(y-1)(G_2 - J_2) \tag{10}$$

(1) If$G_2 = J_2, F(y) = 0$, it means that all levels are stable, that is, no matter what the initial proportion of the real estate companies choosing the strategies of "reducing house prices" and "reducing supply", the proportion will not change over time.

(2) if$G_2 \neq J_2, F(y) = 0$, the two stable points are$y = 1, y = 0$.

The derivative of $F(y)$ is:

$$F'(y) = (2y-1)(G_2 - J_2) \tag{11}$$

There are two cases:

(a) If $G_2 > J_2, F'(y)|_{y=0} < 0, F'(y)|_{y=1} > 0, y = 0$ is stable, real estate companies choose reducing house prices as an ESS.

(b) If $G_2 < J_2, F'(y)|_{y=0} > 0, F'(y)|_{y=1} < 0, y = 1$ is stable, real estate companies choose reducing supply as an ESS.

The dynamic evolution of real estate companies is shown in the figure 3:

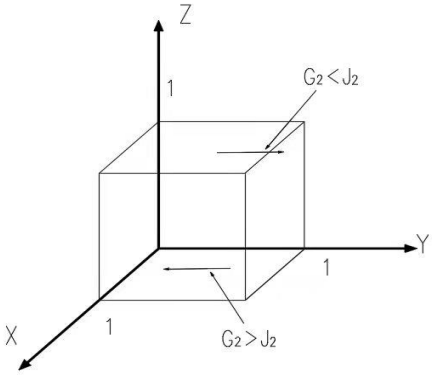

Fig 3. The dynamic evolution of real estate companies.

Note: After the size relationship between G2 and J2 is determined, the evolution direction of the points in the whole cube plane is consistent. The figure shows the evolution direction in the case of different size relationships.

Analysis of Game Equilibrium of Central Government. According to Table 2, the expected benefit of the "without investigation" strategy U_{C1}, the "investigation" strategy$U_{C2}$and the overall average expected benefit of real estate companies $\overline{U_C}$are:

$$U_{C1} = xy(A_3 + G_3) + x(1-y)(A_3 - J_3) + y(1-x)(-E_3 + G_3) + (1-x)(1-y)(-E_3 - J_3) \tag{12}$$

$$U_{C2} = xy(A_3 - B_3 + G_3) + x(1-y)(A_3 - B_3 - J_3) + y(1-x)(-E_3 + G_3 - B_3 + R) + (1-x)(1-y)(-E_3 - J_3 - B_3 + R) \tag{13}$$

$$\overline{U_C} = zU_{C1} + (1-z)U_{C2} \tag{14}$$

The replicator dynamics equation of center government is:

$$F(z) = \frac{dz}{dt} = z(1-z)(B_3 - R + xR) \tag{15}$$

For the convenience of discussion, let:

$$x_0 = \frac{R - B_3}{R} \tag{16}$$

If $x = x_0, F(z) = 0$, it means that all levels are stable, that is, no matter what the initial proportion of the central government's choice of "investigate" and "not investigate" strategies is, the proportion will not change over time.

(2) if$x \neq x_0, F(z) = 0$, the two stable points are$z = 0, z = 1$.

The derivative of $F(y)$ is:

$$F'(z) = (1-2z)(B_3 - R + xR) \tag{17}$$

There are two cases:

If $x > x_0, F'(z)|_{z=0} > 0, F'(z)|_{z=1} < 0, z = 1$ is stable, the central government chose not investigating as an ESS.

If $x < x_0$, $F'(z)|_{z=0} < 0, F'(z)|_{z=1} > 0, z = 0$ is stable, the central government chose investigating as an ESS.

The dynamic evolution of central government is shown in the figure below:

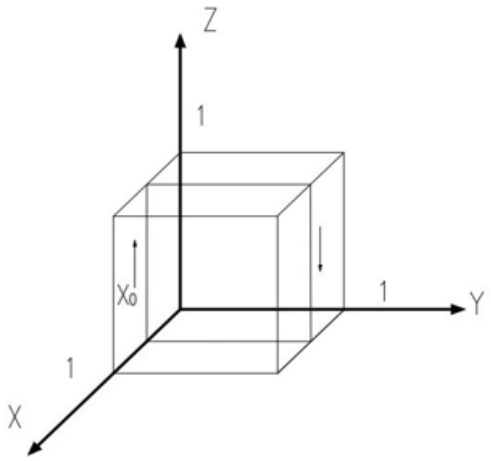

Fig 4. The dynamic evolution of central government.

Note: In a three-dimensional cube, the evolution direction of the point in front of the segmentation plane is Z = 0, and the evolution direction of the point behind the segmentation plane is Z = 1.

4. Numerical Method Analysis

4.1 Analysis Assumptions

Generally speaking, in multi-party games, although the parameters are unknown and there is information asymmetry, the parameters will be assumed to meet certain conditions, so that the model itself covers all the analysis directions. Except that the real estate company will unilaterally judge the subjective and objective quantitative values (the entire spatial evolution direction is the same), the central government and local governments need to analyze each other's behavior. Therefore, it is assumed that the segmentation surface of the two phase diagrams should fall within a limit range, determined by scope of x, y, and z, that is, the 1x1x1 cube. This means: -F < A1 - B1 - C1 + C2 + E1 < 0, 0 < R - B3.

4.2 Stability Analysis Based on Jacobian Matrix

Based on the existing assumptions, this paper gives the corresponding Jacobian matrix, as shown in Formula (18).

$$\mathrm{J} = \begin{bmatrix} J_1 & J_2 & J_3 \\ J_4 & J_5 & J_6 \\ J_7 & J_8 & J_9 \end{bmatrix} = \begin{bmatrix} \partial F(x)/\partial x & \partial F(x)/\partial y & \partial F(x)/\partial z \\ \partial F(y)/\partial x & \partial F(y)/\partial y & \partial F(y)/\partial z \\ \partial F(z)/\partial x & \partial F(z)/\partial y & \partial F(z)/\partial z \end{bmatrix} \tag{18}$$

Table 3. (Jacobian matrix value of the model).

$-(2x-1)$ $*(A_1 - B_1 - C_1 + C_2 + E_1 + F - Fz)$	0	$Fx(x-1)$
0	$(2y-1)(G_2 - J_2)$	0
$-Rz(z-1)$	0	$-(2z-1)(B_3 - R + Rx)$

When the real estate agent cooperates closely with the local government, as well as frequent personnel communication and other reasons, preference will be formed in decision-making, which is reflected in G2 and J2 in quantitative form in the model. The local government does not want the local house price to decline seriously, which will have a significant impact on local finance and political achievements. This idea may be passed on to local real estate companies, so in this case, the benefit of tightening supply to lock in house prices is greater than the price reduction, which means that the negative impact of reducing supply J2 is smaller than the impact of lowering house prices G2, that is, G2>J2.

In this case, judging the positive and negative eigenvalues of the Jacobian matrix corresponding to the pure strategy: ESS requires that all three eigenvalues of the Jacobian matrix are negative. The eigenvalues with G2 - J2 do not meet the requirements. (0, 1, 0), (0, 1, 1), (1, 1, 0), (1, 1, 1) are unstable. Similarly, since 0 < R - B3, the eigenvalue with R - B3 does not meet the requirements, and (0, 0, 1) is an unstable. According to the model assumption, B3 > 0, the eigenvalues containing B3 do not meet the requirements, and (1, 0, 0) are unstable points. -F < A1 - B1 - C1 + C2 + E1 < 0, (1, 0, 0), (0, 0, 0) are unstable. All points are not ESS.

Table 4. Eigenvalue and Stability Analysis of Jacobian Matrix for Each Pure Strategy under General Assumptions.

Pure Strategy	**Eigenvalue of Jacobian Matrix**	**Stability conclusion ($G_2 > J_2$)**	**Stability conclusion ($G_2 < J_2$)**
$(0, 0, 1)$	$J_2 - G_2$ $R - B_3$ $A_1 - B_1 - C_1 + C_2 + E_1$	n	n
$(0, 1, 0)$	$G_2 - J_2$ $B_3 - R$ $A_1 - B_1 - C_1 + C_2 + E_1 + F$	n	n
$(0, 1, 1)$	$A_1 - B_1 - C_1 + C_2 + E_1$ $G_2 - J_2$ $R - B_3$	n	n
$(1, 0, 0)$	$J_2 - G_2$ B_3 $-(A_1 - B_1 - C_1 + C_2 + E_1 + F)$	n	n
$(1, 0, 1)$	$J_2 - G_2$ $-B_3$ $-(A_1 - B_1 - C_1 + C_2 + E_1)$	n	n
$(1, 1, 0)$	$-(A_1 - B_1 - C_1 + C_2 + E_1 + F)$ $G_2 - J_2$	n	n
$(1, 1, 1)$	B_3 $-(A_1 - B_1 - C_1 + C_2 + E_1)$ $G_2 - J_2$ $-B_3$	n	n
$(0, 0, 0)$	$J_2 - G_2$ $B_3 - R$ $A_1 - B_1 - C_1 + C_2 + E_1 + F$	n	n

4.3 Stability Improvement Method

At present, no point in a stable state can be found, which also shows a stalemate in the current situation. If you want to break through, you need to look for opportunities outside of assumptions. Mathematically, it means that extreme conditions occur, that is, the segmentation surface must move outside of the 1x1x1 cube.

If the central government thinks that the cost of the investigation is too big and not enough to make a satisfactory change, that is, the investigation is not necessary. In quantitative terms, it is B3 > R, and in the case of G2 > J2, (0, 0, 1) becomes a stable point. When G2 < J2 (0, 1, 1) becomes a stable point.

(0, 0, 1) means that the local government does not implement and the local real estate company cooperates with the government to tighten the supply, lock the house price, and the central government does not carry out the investigation. This will lead to the real estate tax reform has no deep effect, and may even be just a show. This is also related to the central government's cautious attitude towards the investigation. The situation of (0, 1, 1) is similar to that of (0, 0, 1), except that the real estate company has taken measures to reduce the house price under the pressure of many parties, which is better than the former from the perspective of people's livelihood.

However, due to the inability to ensure a reasonable decline in house prices, the central government has a certain probability to act. This means that it is urgent to improve the people's livelihood in housing, which obviously makes the quantitative indicator R greater than B3. Then the above two

point's will again become unstable points, and other factors should be considered at this time. As far as the central government is concerned, the implementation of the investigation will waste money and labor, and it more or less will cause certain impact. If the investigation is not carried out, the above undesirable results will be produced. However, the most ideal position is to "wait for work with ease", completing the control of the local government's implementation of policies by controlling other factors, and form a situation that the central government will not investigate, and the local government will also implement the policy.

Since B3 > 0 is the basic assumption of the model, and the relationship between G2 and J2 is the premise for discussion in different situations, there is no need to discuss them. Then the remaining factor is the first one in the 5.1 assumption: -F < A1 - B1 - C1 + C2 + E1 < 0. If A1 - B1 - C1 + C2 + E1 > 0, the split plane in Figure 2 will move up out of the cube. When G2 > J2, (1, 0, 1) becomes a stable point. When G2 < J2, (1, 1, 1) becomes a stable point. (1, 0, 1) and (1, 1, 1) are both policies implemented by the local government and not investigated by the central government. This is the best solution. No matter what measures the real estate company takes, it will have no notable impact due to the limitations of the general environment

First, analyze the reasons for A1 - B1 - C1 + C2 + E1 < 0: to a large extent, it comes from the windfall profits of land finance [x]. The excessive C1 leads to local governments' unwillingness to lay down the land finance. Even if this is an economic model of unsustainable development, local government leaders will hesitate to move forward with sustainable transformation in consideration of their political achievements during their tenure. In addition, the implementation cost left by the central government to local governments is also heavy [y], and too large B1 will also lead to deadlock.

As shown in Table 5, the tax revenue of local governments increased after the real estate tax reform, the heavy tax collection obviously does not conform to the strategy of the central government, so C2 cannot play a key role. The situation of E1 is that the local government is too excessive and seriously neglects the instructions of the higher authorities, which leads to the non-implementation of the policy has a great negative impact on the local government, and the great negative impact is reflected in many aspects. In this way, the local government will naturally implement the policy without much supervise from the central government. However, we can neither expect nor hope that the incident of mending the situation after the loss will happen, so E1 also cannot play a key role. But the last remaining A1 will be a breakthrough. If the central government can make local governments implementation of policies is enough worth doing in any way, through some positive encouragement, it will top A1 - B1 - C1 + C2 + E1 above 0, and the goal will be achieved.

Table 5. Eigenvalue and stability analysis of Jacobian matrix under each improved pure strategy.

Pure Strategy	**Eigenvalue of Jacobian Matrix**	**Stability conclusion ($G_2 > J_2$)**	**Stability conclusion ($G_2 < J_2$)**
$(0, 0, 1)$	$J_2 - G_2$ $R - B_3$ $A_1 - B_1 - C_1 + C_2 + E_1$	n	n
$(0, 1, 0)$	$G_2 - J_2$ $B_3 - R$ $A_1 - B_1 - C_1 + C_2 + E_1 + F$	n	n
$(0, 1, 1)$	$A_1 - B_1 - C_1 + C_2 + E_1$ $G_2 - J_2$ $R - B_3$	n	n
$(1, 0, 0)$	$J_2 - G_2$ B_3 $-(A_1 - B_1 - C_1 + C_2 + E_1 + F)$	n	n

$(1,0,1)$	$J_2 - G_2$ $-B_3$ $-(A_1 - B_1 - C_1 + C_2 + E_1)$	ESS	n
$(1,1,0)$	$-(A_1 - B_1 - C_1 + C_2 + E_1 + F)$ $G_2 - J_2$	n	n
$(1,1,1)$	B_3 $-(A_1 - B_1 - C_1 + C_2 + E_1)$ $G_2 - J_2$ $-B_3$	n	ESS
$(0,0,0)$	$J_2 - G_2$ $B_3 - R$ $A_1 - B_1 - C_1 + C_2 + E_1 + F$	n	n

5. Conclusion

In conclusion, after clarifying the conflicts of interest in the tax reform, the authors of this paper construct a game model and make a conclusion. The main points of the tax are the comprehensive benefit it gives to local governments. In order to promote the reform of it, we should emphasize the optimization of the real estate tax on the people's livelihood, the real estate industry and the local financial system:

First, the reform of the text can be a great tool to control the price of the houses. Compared with the amount of real estate tax that is being piloted in Shanghai and Chongqing, the amount of tax in real estate which is going to be levied in the future will be comparably larger. What's more, the ability to regulate and control housing prices will also be enhanced, which will enable the housing prices to be effectively regulated, leaving no space for criminals to damage the market of house. Therefore, developing a healthy development of the houses' market that is beneficial to the government, enterprises and the people is no longer a dream.

Secondly, the tax reform can provide a new approach to deal with the problem of uneven income distribution. Taxation on real estate ownership can be beneficial to wealth redistribution, contributing to achieve social justice and fairness. What's more, government will be given a chance to increase their income by the Land Value Increment, rather than let the property owners enjoy the wealth brought by urban construction. After government invests in urban construction, the tax will be beneficial to promote the circulation between the real estate value and the real estate tax revenue.

For local governments, the tax can also solve the problem of excessive dependence of local finance on land. Specific tax rate and tax reduction plan should fully consider the economic growth of each city and town, which can be determined after discussion. Being famous for its characteristics, such as very stable income, the tax a favorable alternative to the local main tax.

Based on the analysis, authors suggest that we should continue to pursue this policy. The central government can actively support the real estate tax examination and text, while gradually improving the local government's awareness on the real estate tax, and assisting the local government to formulate a practical plan. By solving the local government's financial problems, a sustainable financial system could be established.

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