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Macroscopic economic effect analysis of property tax reform and price change based on the DSGE model

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ABSTRACT

In recent years, the housing price problem has become a major problem. All kinds of analysis and policy suggestions can be seen in the press, the Internet and all kinds of journals. But about how the change of house prices will affect the macro economy and what is the influence mechanism of action still lack of a detailed analysis. Another important issue associated with house prices is the problem of real estate tax reform. At present, the academia tends to use econometric analysis based on regression method to discuss the macroeconomic effect of property tax and land prices. In the study of property tax, scholars have focused on real estate taxes effects on housing prices and other economic variables. Jin and Zeng (2004) are first to bring housing investment problem into the research of DSGE models; domestic scholars Tan Zhengxun and Wang Cong (2011) also use DSGE model to discuss the price fluctuations affecting the financial stability[4].

KEYWORDS

Property tax reform; Price change; DSGE model; Macroscopic economic effect analysis.

PROPERTY TAX REFORM

In late May 2010, the state council approved and released *Opinions on deepening the reform of economic system priority in 2010* which confirmed to gradually introduce the property tax reform ideas. In May 2011, the Chinese social sciences academy published in *China's real estate development report No. 8* advice real estate tax reform pilot in Shanghai and Chongqing in the "twelfth five-year" period, and should speed up the promotion to the whole nation. And also should further strengthen the housing to hold link tax. At the same time, because the house tax reform itself can affect the change of housing prices, and in turn house price changes will be larger influence the property tax revenue.

Introduction of property tax reform

Property tax is also called the housing tax. Property tax in China targets house as the levy object. Impose a property tax to the property owner according to the tax on residual value of the house or housing rental income. Property tax is widely imposing in the ancient Chinese and foreign government. Various countries have many means in the aspect of rein in property prices, in addition to the property tax, land value-added tax, capital gains tax and property tax, etc. On September 15, 1986 the state council of the People's Republic of China promulgated real estate tax as temporary byelaw, which had been carried out since October 1. At this point, the property tax is collected in the nationwide. As land supplies cannot reach the demands in recent years, rising house prices is imperative to control prices. The government released "the new ten" in order to control house prices. And on May 31, in agree with the national development and reform commission of the state council, *about 2010's opinions on deepening the reform of economic system priority explicitly* was pointed out to promote the reform of the property tax step by step[3].

Rapid rise in house prices has a huge impact on all aspects of society, mainly displays in the impact on the economy and the impact on the society. On the economy, in the context of relative excess liquidity, the housing market produced a lot of investment in speculative demand, which caused part of the urban housing prices rising rapidly in the short term. As a result, on the one hand, many people, there is a pressing demand for homes but cannot afford to buy it; on the other hand, a large number of speculators who held numerous houses at very low cost, waiting for profit. High down payment and monthly payments are obvious compression for working-class consumption demand, and most buyers have cut back on the consumption of other goods and services, which has a serious negative effect effect on China's policy of stimulating domestic demand. Also it becomes one of the important obstacles to expand consumer demand.

Reason for property tax reform

Fast rising of housing price increased the cost of the rural surplus labor force transferring to towns, also hindered the development of urbanization process. The important content of the property market regulation is give full play to the tax policy of housing consumption and the real estate market adjustment. Tax on housing property will have a significant impact on the housing market, the development of national economy in China and will have far-reaching influence on alleviating social contradictions[1].

TABLE 1 : Housing price, house tax and rent price of 33 cities in china from 1996-2008

Year	City			East cities			Central cities			West cities		
	PG	LGR	PC	PG	LGR	PC	PG	LGR	PC	PG	LGR	PC
1996	-	7.70	-	-	7.37	-	-	7.97	-	-	7.86	-
1997	-3.00	.787	-	-5.66	6.09	-	0.18	11.41	-	3.02	6.90	-
1998	17.90	8.26	-	11.25	4.79	-	10.62	14.40	-	34.67	7.03	-
1999	2.20	9.24	11.56	1.22	6.00	14.65	2.44	14.00	4.98	3.17	8.88	13.30
2000	0.12	8.57	21.53	-1.71	6.22	10.55	1.32	13.59	4.77	1.32	7.04	48.21
2001	1.63	8.23	31.92	2.63	4.92	24.62	2.65	15.22	53.54	-0.39	6.14	22.85
2002	6.00	7.20	44.88	7.16	4.31	41.03	4.14	11.30	77.53	6.15	6.09	22.71
2003	1.89	6.08	60.12	3.10	5.22	62.71	1.83	8.13	72.63	0.52	5.41	46.82
2004	10.01	5.55	75.07	13.55	4.95	77.82	8.56	7.15	76.78	7.00	1.94	70.44
2005	13.38	5.04	54.70	9.80	4.40	54.02	15.63	6.48	59.56	15.78	4.60	51.53
2006	5.51	4.14	63.31	8.34	3.99	63.70	5.48	4.10	55.06	2.19	4.63	69.61
2007	11.16	3.28	72.81	11.63	3.28	67.28	15.67	4.91	65.01	6.86	3.58	85.72
2008	10.97	3.75	49.65	25.86	3.10	43.50	-3.73	5.12	61.02	5.41	3.24	47.06
Average	6.75	6.55	48.68	7.62	5.04	46.34	5.73	9.53	53.09	6.50	5.86	47.83

"-" represents that there is no record; TGR represents the ratio of house tax and urban financial income; PG represents the increase rate of the housing price; LGR represents the ratio of renting price and financial income of the city[9].

THE PROPERTY TAX REFORM AND HOUSING PRICE CHANGE

The economic effect mechanism of property tax

Property tax is the important lever for government to regulate the real estate market. In general, property tax will produce two kinds of economic impacts: the income effect and substitution effect. Real estate tax revenue effect refers to transfer part of the taxpayers' income to the hands of the government through property tax levy, which causes resources transfer. The property income effect, on the one hand, can increase the financial effect of local government, on the other hand can transfer payments to the resource allocation through the government's tax, and then adjust the residents' income. Substitution effect of property tax refers to property tax levy causing property changes in relative prices, causing the change of the supply-side and demand-side economic decision-making behavior; this causes the real estate market on the change of housing supply and demand and thus caused real estate prices fluctuate. The economic effect of property tax and its transmission mechanism can be shown in the Chart 1

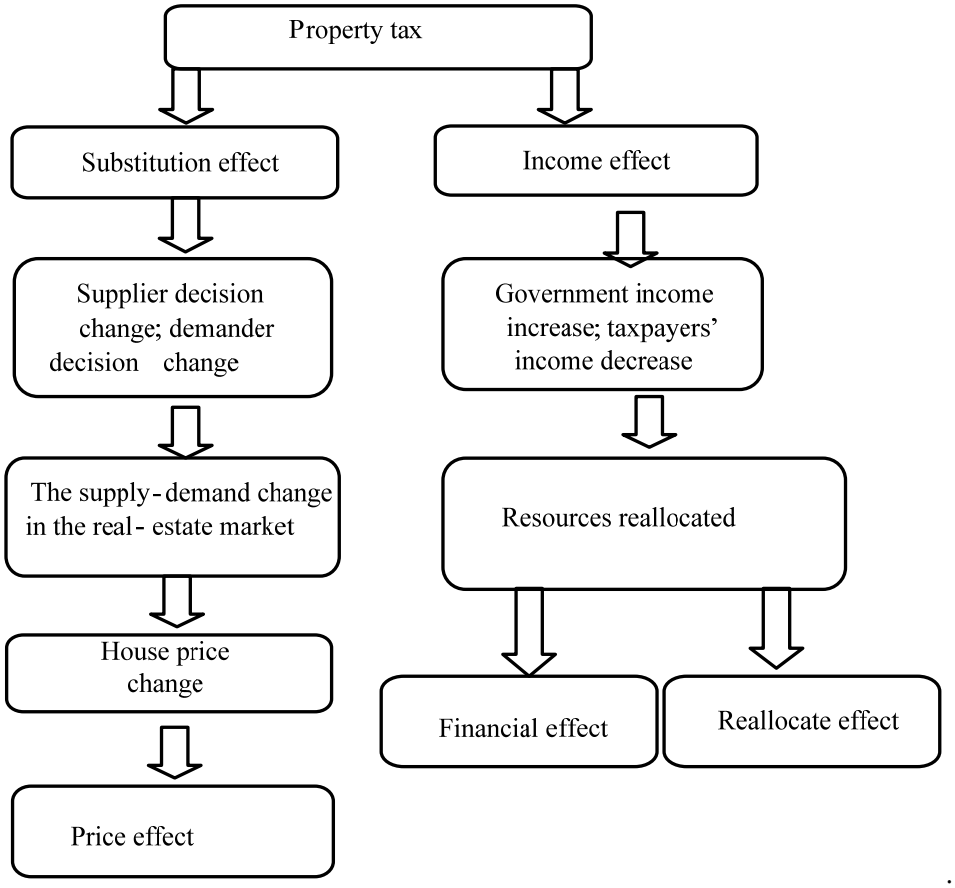

Chart 1 : The real-estate tax economic effect mechanism

The property tax and housing price

According to researches of Oates, Chen and Yang Shaoyuan scholars about the relation between real estate taxe and housing prices, we can establish long-term equilibrium equations of the two, which is shown in the Figure 1:

$$HP_t = \alpha + \beta RET_t + \mu \quad \textbf{(1)}$$

In the formula 1, HP represents the housing price, using average sales price data of the commercial house. RET represents real estate tax, using a total of 6 kinds of the sum of tax revenue as an agent of the real estate tax variables that are real estate as the land value-added tax, urban land use tax levy object, cultivated land usage tax, property tax, urban real estate tax and the deed tax. α is intercept item; β is regression coefficient vector; t represents time; μ is random error, which is neglected factors of the models changing over time[5].

To estimate the Figure 1 we can get residual error sequence, setting which as error correction to establish error correction model in the formula 2:

$$\Delta HP_t = c + \sum_{i=1}^{n}(\alpha i \Delta HP_{t-i} + \beta i \Delta RET_{t-i}) + \theta vecm_{t-1} + \mu_t \quad (2)$$

Formula 1 and formula 2 altogether show the dynamic model of the housing price change; Figure 1 represents the long-time equivalence relation between housing price and property; Figure 2 represents the short-time change of housing price not only depends on the real-estate tax but the degree of the housing price deviation from equilibrium.

If we use the method of Granger causality test of the causal relationship between house prices and the real estate tax, then the test between the two equations can be expressed as:

$$HP_t = \alpha_0 + \sum_{i=1}^{m}\alpha_i HP_{t-i} + \sum_{i=1}^{m}\beta_i RET_{t-i} + \xi_i \quad (3)$$

$$RET_t = \alpha_0 + \sum_{i=1}^{m}\alpha_i RET_{t-i} + \sum_{i=1}^{m}\beta_i HP_{t-i} + \xi_i \quad (4)$$

Reconfirm the formula 3 $\beta_i(i=1,2,3...m)=0$, which also is "RET is not the reason to cause HP changing". If refuse the hypothesis that $\beta_i = 0$, then RET and HP have the causal relationship. With the same theory, reconfirm the Figure 4 $\beta_i(i=1,2,3...m)=0$ to judge if the causal relationship between HP and RET is existed.

The linearization of nonlinear DSGE model

Dynamic stochastic general equilibrium (DSGE) model is based on the micro and macro economic theory, adopts the method of optimizing the behavior to investigate each subject. General DSGE model often includes behavioral decision of government departments (monetary authorities, the central bank, and financial department), but based on the theory of the real economic cycle RBC and DSGE model equation not including the policy actions of monetary institution. In particular, DSGE models must be taken into account in decisions among the behavior subjects of its current influence behavior, and the subsequent effects of the future[6].

Assumption that there is the following nonlinear equation[10]:

$$\phi(x_t, Y_t) = f(Z_t) \quad (5)$$

Then we adopt the first order Taylor expansion in its steady state (X, Y) can be opened out of linear form of the equation. S represents the variable S_t in the steady state value.

$$\phi(X,Y) + \frac{\partial \psi}{\partial X_t}(X)\cdot(X_t - X) + \frac{\partial \psi}{\partial Y_t}(Y)\cdot(Y_t - Y) = f_Z(Z)\cdot(Z_t - Z) \quad (6)$$

The steady situation, the Figure 6 can be changed to the following:

$$\frac{\partial \psi}{\partial X_t}(X)\cdot X\cdot\frac{(X_t - X)}{X} + \frac{\partial \psi}{\partial Y_t}(Y)\cdot Y\cdot\frac{(Y_t - Y)}{Y} = f_Z(Z)\cdot Z\cdot\frac{(Z_t - Z)}{Z} \quad (7)$$

Using the variable S_t to get the logarithmic deviation of its steady-state value S:

$$\hat{s}_t = \log\left(\frac{S_t}{S}\right) \cong \frac{S_t - S}{S} \quad (8)$$

And we can get the logarithmic linearization form of Figure 7 from Figure 5:

$$\frac{\partial \psi}{\partial X_t}(X)\cdot X\cdot\hat{x}_t + \frac{\partial \psi}{\partial Y_t}(Y)\cdot Y\cdot\hat{y}_t = f_Z(Z)\cdot Z\cdot\hat{z}_t \quad (9)$$

TABLE 2 lists the more important the endogenous variable of the equilibrium value. To investigate whether the model is close to the real economy, TABLE 2 also adopts the real value of the endogenous variables in 2010. From the size of the relationship between real value and balanced view, the biggest gap is only 0.5

TABLE 2 : Deterministic steady state equilibrium solution and the real economic variables

Variable	y	g	c	m	i	k	h
Equilibrium value	2.83	0.63	1.1	5.91	0.24	7.65	5.95
Real value in 2010	3	0.55	1	5.41	0.34	8.03	5.99

Can be seen from TABLE 3, the increase of housing property tax rate has a negative impact on consumption, output and capital accumulation, housing, housing investment value and monetary balance, but on the other hand can increase the public service. Appearance of negative effects results from real estate tax reducing the residents' enthusiasm of investment and consumption. Due to the increase of public services benefiting ascension, which cannot make up for smaller welfare loss brought by the other variables, so the real estate tax rate increase leads to a decrease in the level of welfare. Also it can be found in all the change of the endogenous variable, narrowing the size of the largest housing value. Due to the chance to reduce the availability of housing area is very small, which means that the equilibrium price of housing decline.

TABLE 3 : comparative static analysis on the impact of property tax rates on deterministic steady state solutions

Property tax rate	y	g	c	m	i	k	h	u
T_h=0.000	2.8389	0.577083	1.13399	6.09096	0.266281	7.68214	6.65694	1.43077
T_h=0.005	2.83193	0.604296	1.11668	5.99799	0.251452	7.66374	5.28632	1.40023
T_h=0.010	2.82566	0.6050539	1.10119	5.91482	0.238188	7.64728	5.95463	1.37042
T_h=0.015	2.82003	0.628673	1.08726	5.83999	0.226253	7.63247	5.65626	1.34146
T_h=0.020	2.81494	0.670351	1.07466	5.7723	0.215457	7.61907	5.38636	1.31343
T_h=0.025	2.81032	0.688359	1.06321	5.71078	0.205644	7.60689	5.14105	1.28635

MACROSCOPIC ECONOMIC EFFECT

First of all, a property tax will effectively restrain the speculative demand in real estate market, and promote the sustainable development of the real estate market. For the real estate market, widespread speculative demand will have disastrous consequences. Widespread speculative demand makes the real estate prices seriously deviate from its value, finally formed a real estate bubble, the real estate market development unsustainable. Property tax is a property tax on property holders. So it's different from stamp duty on property trading links such as tax, property tax will significantly change the property of holding costs. Speculators will have to consider a sale or rental property, thus increase the market supply, and rein in property prices from rising too fast, form a good situation for the sustainable development of the real estate market.

Secondly, a property tax will promote industrial structure optimization adjustment on the basis of implementing the rational regression house prices through marketing channels, forming a more sustainable economic structure. A property tax can achieve the goal of sustainable development of the real estate market by promoting the rational regression house prices. And it is able to avoid overcapacity problem and realize the optimization of industrial structure adjustment, finally forms the healthy economic structure[8].

Furthermore, property tax will change the fiscal and taxation systems in China, change local government behaviors, form more socialist market economy with Chinese characteristics accord with the requirement of economic development. Local governments will get a very strong incentive, make efforts to develop local entity economy, expanding employment, attracting foreign talent settled in local life. It can form a new form of regional economic competition-- the talent competition.

Above all, a property tax will have great macroeconomic effects. The property tax levy is the guarantee of breaking "land finance", realizing the optimization of economic structure adjustment, finally promoting the important system for the sustainable development of macro economy. Therefore, we should seriously sum up experience, timely impose the property tax on a national scale on the basis of positive pilot.

SUMMARY

Setting housing property tax as the main target of real estate tax reform in the long term can effectively reduce the prices, but also can bring negative influences to macro economy and reduce the residents' welfare. Real estate tax reform can play better property tax automatic stabilizers function. Moderate rise in house prices have a negative effect on the macro economy in the short term, but the negative effect will gradually disappear and eventually into a positive role in promoting.

Soaring house prices moderate consumption and real money balances promoting faster than the accumulation of capital and production, the "wealth effect" ahead of the "production effect". If house prices rise in malignant state for a long time, it will bring serious negative impact on the broader economy. Positive fiscal policy shocks can be realized in the short term to the output and the promoting effect of public services does not result in a rapid rise in property values, and although monetary policy will lead to the rise in property values, but the output, consumption and other variables continuous positive influence. Positive impact housing preferences and consumer preferences will bring some negative effects on the broader economy, but the impact on output and consumption preference public services such as variable has a more lasting positive impact.

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