Renewal of Land Transfer Fee and Real Estate Tax in the Silver Age of Real Estate: Potential Estimation, Functional Substitution and Policy Design

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Abstract: Focusing on the current hot discussion on the collection of real estate tax and how to renew the land use term, this paper discusses how to deal with the relationship between real estate tax and land transfer in the future. Taking Guangzhou land market as the research object, by establishing an alternative analysis framework for Guangzhou real estate tax and transfer fee, the total amount of existing urban residential buildings in Guangzhou is estimated based on GIS technology, the effect of real estate tax and land transfer fee is empirically analysed, and finally the process of government collecting real estate tax is simulated. Providing theoretical analysis and policy design for the functional substitution between Guangzhou's future real estate tax collection policy and transfer fee renewal policy.

1 INTRODUCTION

The golden age of real estate has passed which is becoming the basic consensus of professionals. In order to promote high-quality economic development, we have to improve the ability to prevent and resolve major risks. Therefore, the future land financial transformation and the resolution of local government debt risks urgently need the reform of the national financial and tax system and management system (Yang, et al, 2021, Zhang, et al, 2016). The legislation of real estate tax is imminent. Can the real estate tax gradually replace the land transfer fee? Can ordinary people no longer pay the due land transfer fee under the condition of paying real estate tax? These are hot topics at present, and they are also hot issues related to the basic livelihood and well-being of the people (An, 2015).

In recent years, real estate tax legislation is a hot topic in the two sessions every year, and it is also a hot spot in China's tax system reform, but there is no specific timetable for its collection. At present, the development trend of China's real estate is very complex. On the one hand, the expiration and renewal of commercial housing not only brings confusion to residents, but also affects the real estate market; On the other hand, the real estate tax to be introduced by the state is also like a fog. How to deal with the expiration and renewal of residential land use right has always been a widely concerned problem by the government and academia (Yi, et al, 2017, Zhang, 2021). At the same time, the real estate tax, which is closely related to the real estate market and people's life, has also attracted extensive social attention. On the issue of land renewal upon expiration, although the property law states "automatic renewal", there are no specific legal provisions on the details such as how long the renewal period is and whether the transfer fee needs to be paid. Since the tax system reform in 1994, the land transfer fee has been placed under local management, which has improved the land utilization rate, but due to the unreasonable structure of local fiscal revenue, the mode of relying on land sales to obtain income to fill local fiscal revenue is unsustainable. Therefore, the current institutional problem is how to deal with the relationship between

real estate tax and land transfer fee, which is an urgent problem to be discussed and solved.

2 GUANGZHOU REAL ESTATE TAX POTENTIAL ESTIMATION AND FUNCTION SUBSTITUTION

### 2.1 Alternative Analysis Framework of Real Estate Tax and Transfer Fee

The collection of real estate tax can not only maintain the financial revenue of local governments, but also take into account people's acceptance ability. This study takes Guangzhou land market as the research object to estimate the renewal land transfer fee under the background of Guangzhou real estate tax in the future. This study assumes that the transfer fee to be paid for new land (including renewed land) in the future will be reduced, and the reduction of land transfer fee will reduce the financial revenue of local government. In order to maintain the source of government revenue, the total amount of land transfer fee reduction and renewal add up to the total amount of real estate tax collection every year (Chen, et al, 2016).

2.2 Empirical Calculation of Real Estate Tax Collection

2.2.1 Using GIS Technology to Estimate the Total Value of Existing Urban Housing in Guangzhou.

The tax base of real estate tax is the value of residential taxable area. To study the impact of Guangzhou real estate tax on local finance, we should consider the total value of urban housing in Guangzhou. Since the housing information is not disclosed to the public, the area of urban housing in 2021 is unknown. The total amount of urban housing in 2021 is estimated by GIS technology. The estimation process is shown in Figure 1.
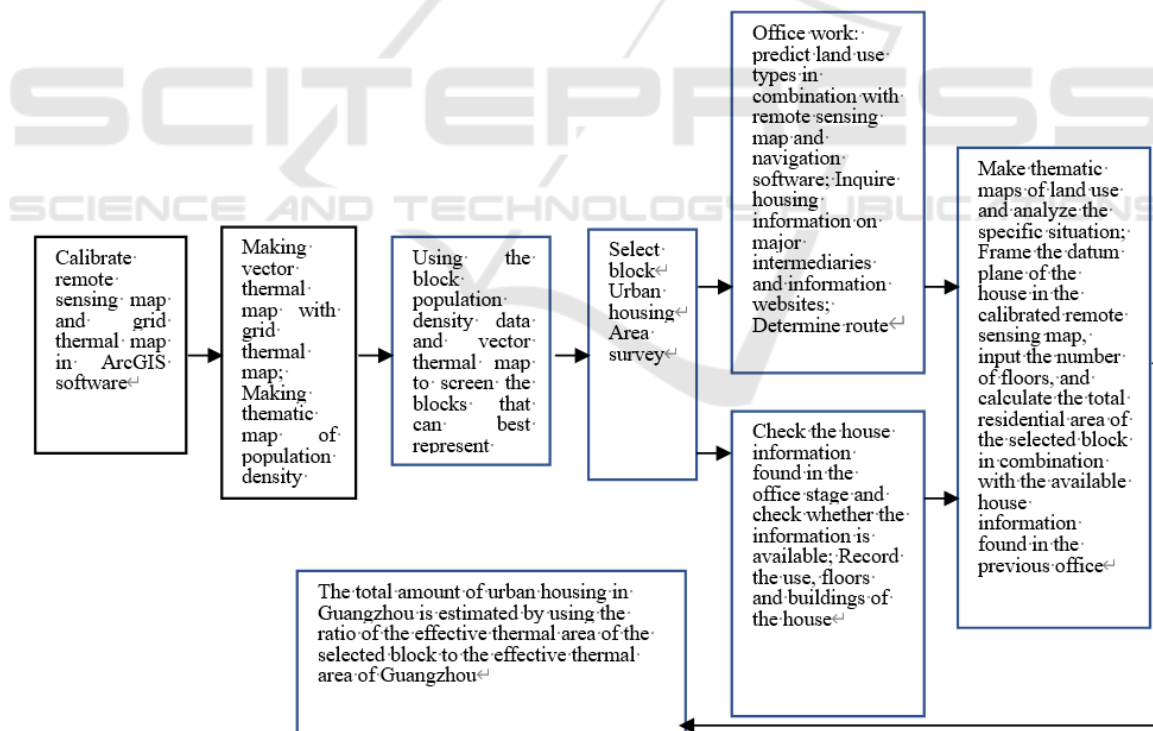
Source: the author made his own according to the research results

Figure 1: Technical roadmap of GIS estimation.

a) Selection of representative blocks

In order to estimate the total amount of urban housing in Guangzhou more scientifically, block population density data are selected. The blocks close to the average population density are used as the survey object, by comparing the block thermal scale map with the thermal map of Guangzhou to ensure that the selected blocks are more representative by observing the availability (Luo, et al, 2007).

Through the observation of block remote sensing map and comparing the uniformity of land use type, building density and residential distribution, we found that the residential distribution of Tianyuan street is relatively uniform, the area of urban villages is small, and the average population density of Guangzhou block is the smallest in the representative area. Combined with the difficulty of field

investigation, Tianyuan street is preliminarily selected as a representative block.

b) Estimation of urban residential area in Tianyuan Street

In the internal business stage, the residential area is counted from the existing data, and the availability needs to be checked in the external business stage. To estimate the residential area using GIS technology, it is necessary to collect the number of residential floors, housing structure, supporting commercial building floors and structures in the field stage, and give corresponding symbols in the calculation process for accumulation or elimination. To estimate the residential area using GIS technology, it is necessary to accurately deduct the building datum from the remote sensing surface after calibration, and then input the number of floors to calculate the calculation results (see Table 1).

Table 1: Urban residential area of Tianyuan Street.

project	Area (M2)
Calculate the urban residential area obtained from Tianyuan street with ArcGIS (excluding the statistical part of existing data)	1730355.057766
Statistics of urban residential area available	5725111.38
Estimated total urban housing area of Tianyuan Street	7,455,466.437766

Source: the author calculated according to the research results

c) Estimation of total value of existing urban housing in Guangzhou

The income method is adopted for the appraisal. With reference to the rent data of China real estate intermediary association, the annual net income = monthly rent (yuan / month / m^2) × 12. The rate of return is determined by the rent level and selling

price. Since China only reformed welfare housing distribution into monetary housing distribution in 1998, the service life of commercial housing land in China is generally 70 years. In order to estimate the house price in Guangzhou, the income life is set as 60 years in 2021, and so on in other years. The following data and calculation results are obtained (see Table 2 and table 3).

Table 2: Estimation of the total value of existing urban housing in Guangzhou.

particular year	Annual rent per square meter in year (yuan)	House price (yuan / m2)	Rate of return	Growth rate of net income over the previous year	Years of income	Annual growth rate of net income	Appraisal price (yuan / m2)
2014	400.56	14762	2.71%	19.68%	67		10628
2015	411.36	16555	2.48%	2.7%	66		11919
2016	444.24	19208	2.31%	7.99%	65		13829
2017	486.24	18564	2.62%	9.45%	64		13366
2018	520.92	20016	2.6%	7.13%	63		14411
2019	616.56	22926	2.67%	18.35%	62	5.55	16506
2020	629.4	28578	2.2%	2.08%	61		20576
2021	645.24	32413	1.99%	2.51%	60		23454

Source: the author calculated according to the research results

Table 3: Estimation of total population and housing.

particular year	Proportion of urban population (%)	Permanent resident population (10000)	Per capita housing area (M2)	Total urban residential area (M2)	Appraisal price (yuan / m2)
2014	84.78	1275.96	21.89	234830509.2298	10628
2015	85.02	1283.39	22.46	245069634.7788	11919
2016	85.27	1292.68	22.73	250545570.0428	13829
2017	85.43	1308.05	23.32	260593331.218	13366
2018	85.53	1350.11	24	277139779.92	14411
2019	86.06	1404.35	25.42	307221953.662	16506
2020	86.14	1449.84	29.86 (latest published sampling data)	372919202.7536	20576
2021 (estimated)	86.6	1500	30	389734362.612	23454

Source: the author calculated according to the research results

2.2.2 Empirical Analysis on the Effect of Real Estate Tax and Land Transfer Fee

a) Empirical calculation of real estate tax levy

This paper uses the following formula to simulate and calculate the real estate tax revenue of Guangzhou after the collection of real estate tax:

$$R_h = P_{assess} * T_h * [S_{total} - S_{\overline{free}} * (N_{degree} * 4 + N_{old})]$$

In essence, the above formula shows that the real estate tax income is the difference between the total urban residential value in Guangzhou and the deductible residential value after the real estate tax is levied. Among them, in order to evaluate the average house price, it is calculated according to 72% of the current price; For the real estate tax rate, this paper selects 0.4%, 0.5% and 0.6% to study; It is the tax-free area per capita. In the specific analysis, we divide it into 20m²/ Person, 25m²/ Person, 30m²/ Three scenarios are discussed. For the number of primary and secondary school degrees in Guangzhou, assuming that the student family of each degree is a family of four, the total number of families with houses in Guangzhou can be inferred through the number of degrees 4 and the aging population, so as to calculate the total reduced or exempted housing value in Guangzhou. For the real estate tax rate, referring to the real estate tax rate background formulated by Chongqing and Shanghai, this paper studies the real estate tax rate in three cases: 0.4%, 0.5% and 0.6%, and simulates the calculation results (see Table 4).

Table 4: Income simulation calculation of real estate tax in Guangzhou.

particular year	Number of degrees	Aging population	Total urban residential area	Assess average house price	T_h =0.5%, $S_{\overline{free}}$=30 Real estate tax income at
2015	1381389	1184000	234830509.2	14762	17.82519084
2016	1373263	1264000	245069634.8	16555	25.24329468
2017	1406204	1330000	250545570.0	19208	28.97250868
2018	1432942	1406499	260593331.2	18564	31.03940816
2019	1453098	1475260	277139779.9	20016	42.15953895
2020	1474216	1546091	307221953.7	22926	69.27015554
2021	1234400	1618500	372919202.8	28578	181.3118054

Source: the author calculated according to the research results

Due to space constraints, only the tax rate is 0.5% and the per capita tax-free area is 30m ²/ Real estate tax income calculated by person time. In this paper, based on the reduction area per capita, it is proposed to be 20m² respectively, 25m², 30m² analysis on the substitution effect of real estate income in Guangzhou on land transfer fee in Guangzhou (see Table 5).

Table 5: Estimation of substitution effect of real estate tax on land transfer fee under 0.5% real estate tax rate.

particular year	Land transfer fee (100 million yuan)	Income from real estate tax (100 million yuan)					
		Reduced area 20m²	Substitution effect (%)	Reduced area 25m²	Substitution effect (%)	Reduced area 30m²	Substitution effect (%)
2015	307.4	53.48	17.40%	35.65	11.60%	17.83	5.80%
2016	412.0	65.51	15.90%	45.38	11.01%	25.24	6.13%
2017	762.0	77.06	10.11%	53.02	6.96%	28.97	3.80%
2018	841.0	78.74	9.36%	54.89	6.53%	31.04	3.69%
2019	907.1	94.67	10.44%	68.42	7.54%	42.16	4.65%
2020	282.0	130.70	46.35%	99.98	35.46%	69.27	24.56%
2021	1173.0	248.76	21.21%	215.04	18.33%	181.31	15.46%

Source: the author calculated according to the research results

According to the statistical yearbook of land and resources, the land transfer fee shows an increasing trend as a whole. In 2016, due to the influence of policy regulation, the land transfer fee in Guangzhou was depressed. If it is included in the analysis, which will affect the analysis effect, so it is excluded from the analysis. See Table 6 for the average replacement rate of different tax rates and different reduced areas in 2016-2021.

Table 6: Estimation of average substitution rate of different tax rates and different reduced areas in 2016-2021.

	Substitution effect (%)								
Tax rate (%)	0.40%			0.50%			0.60%		
Reduced area m²	Reduced area 20m²	Reduced area 25m²	Reduced area 30m²	Reduced area 20m²	Reduced area 25m²	Reduced area 30m²	Reduced area 20m²	Reduced area 25m²	Reduced area 30m²
Average substitution effect	11.26	8.26	5.27	14.07	10.33	6.59	16.88	12.39	7.90

Source: the author calculated according to the research results

As can be seen from table 6, when the tax rate is 0.4%, the reduction area is 30m², the real estate tax can averagely replace 5.27% of the land transfer fee; When the tax rate is 0.6%, the reduced area is 20m², the real estate tax can averagely replace 16.88% of the land transfer fee. The above analysis shows that there are two extreme collection methods, while the more moderate collection tax rate is 0.5% and the reduction area is 25m². At this time, the average replacement rate of real estate tax on land transfer fee is 10.33%, and the effect is also more appropriate. However, in the short term, when choosing the appropriate collection rate, we also need to take into account the actual situation of Guangzhou residents' tax burden, tax collection technical conditions and taxpayers' psychological expectations. Limited by objective factors, the collection rate is generally less than 100%. If the collection rate is too low, the effect of real estate retention tax will be affected. Rural real estate is not considered in the estimation of the substitution effect of land transfer fee by real estate tax. If rural real estate is included in the calculation scope, the substitution effect is estimated to make up

for the lack of collection rate. Therefore, it is feasible for real estate tax to replace land transfer fee.

b) Simulating the impact of real estate tax on local fiscal revenue

Based on Guangzhou housing data, this paper simulates and predicts the expected income of Guangzhou personal housing real estate tax, and then analyzes the impact of real estate tax on Guangzhou's fiscal revenue.

Firstly, considering the sustainability of government revenue and the acceptability of public opinion, selecting the real estate tax rate is 0.5% and the per capita tax-free area is 30m² to explore the impact of real estate tax on Guangzhou's fiscal revenue. Based on the analysis of the substitution effect of the former real estate tax on the land transfer fee, the substitution effect is 6.59%; Secondly, select the fiscal and tax data of Guangzhou from 2015 to 2021, and use the time series analysis method to make an empirical analysis with the general budget revenue (Y) as the explanatory variable and the real estate tax revenue (R_h) as the explanatory variable. By analyzing the impact of real estate tax reform on

government revenue effect, a regression model is constructed. The regression model is as follows:

$$LnY = \beta_0 + \beta_1 * LnR_h + \varepsilon$$

Among them, Y represents the general budget revenue of Guangzhou, R_h represents the real estate tax revenue, β_0 represents the constant term, β_1 represents the influence coefficient, and ε is the residual term of the equation. In order to eliminate the influence of heteroscedasticity on the regression equation, logarithms are taken on both sides of the regression equation of the model for linear regression analysis.

① The scatter diagram of the relationship between real estate tax income and general budget income is shown in Figure 2
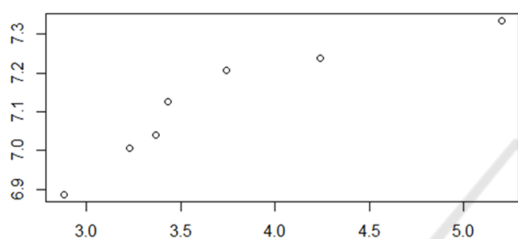
(Abscissa: Real estate income, Ordinate: General budget income)

Figure 2: scatter diagram of real estate tax income and general budget income.

Source: the author calculated according to the research results

According to figure 2, the logarithmic sample data points fall near an approximate straight line, indicating that there is a significant linear relationship between real estate tax revenue and general budget revenue. Because the sample points are not all on a straight line, it shows that the relationship between R_h and Y is not completely linear, and there is an interference term.

② Statistical analysis

Through Pearson correlation analysis (the analysis process is omitted), the correlation coefficient is 0.9225249 and the p value is 0.003077. When the significance level is 0.01, the original hypothesis is rejected and it is considered that there is a significant linear correlation between real estate tax income and general budget income after the introduction of real estate tax. The determination coefficient $R^2 = 0.8511$, the fitting degree of the regression equation is good, which can explain the variance of 85.11% of the dependent variable, and the constant term and regression coefficient are significant at the level of 0.01. The residual diagram shows that all points are within $\pm$ 3 and there are no

abnormal values. It can be considered that the sample data of this example is basically normal, and the research assumptions of the theoretical model are reasonable.

③ Analysis on the impact of levying real estate tax on local fiscal revenue

Through modeling analysis, the regression equation between general budget income and real estate tax income is:

$$LnY = 6.43821 + 0.18293 * LnR_h$$

As shown in the formula, there is a significant positive correlation between the real estate tax revenue and the general budget revenue, the coefficient is 0.18293, and the elasticity is less than 1, indicating that the general budget revenue will increase by less than the real estate tax revenue, that is, for every 1% increase in the real estate tax revenue after the introduction of the real estate tax, the general budget revenue will increase by 0.18%, After the introduction of real estate tax, the real estate tax revenue plays an obvious role in stimulating the financial revenue of Guangzhou.

3 RENEWAL OF LAND TRANSFER FEE UNDER THE BACKGROUND OF FUTURE GUANGZHOU REAL ESTATE TAX: POLICY SIMULATION

3.1 Policy Mix

In order to comply with the public opinion and make the government revenue grow continuously and steadily, according to the survey data and modeling analysis, it is suggested to adopt the following policy combination.

For the general population, 25m more than the per capita tax-free housing[2] (refers to the housing construction area, the same below) shall be calculated according to the tax rate of 0.5% of the average transaction price of new houses in the administrative region in December of the previous year, and the tax system of the current year shall be paid at the beginning of the year, with no upper limit. Tax payable = taxable area * average transaction price of new houses in the administrative region where the house is located in December of the previous year * tax rate.

For retirees, set the age threshold. For example, those who exceed the retirement age (generally 60 years old) only have one set of housing, which is tax-

free no matter how large; If there is more than one set, tax shall be paid from the second set. If more than one suite is not self occupied and has income, it can bear the tax and prevent others from attaching the house to the tax-free quota for tax avoidance.

For retirees, set the age threshold. For example, those who exceed the retirement age (generally 60 years old) only have one set of housing, which is tax-free no matter how large; If there is more than one set, tax shall be paid from the second set. If more than one suite is not self occupied and has income, it can bear the tax and prevent others from attaching the house to the tax-free quota for tax avoidance. For the unmarried young house buyers whose children of Guangzhou families buy houses for the first time in adulthood, if the house purchase area exceeds 100m², Considering the large area of tax payable, the implementation of the registered residence registration fee reduction 50m² for such people, non registered residence registration can enjoy 35m² fee reduction; If the area is less than 100m²/ The registered residence of the city can enjoy 40m² fee reduction. Non registered residence registration can enjoy 25m² fee reduction. The registered residence of singletons has more than 100m². The reduced area is 50m ². The area of tax exemption for those who hold the residence permit for talent introduction in Guangzhou is 50m². The self owned houses built by farmers on the homestead are temporarily exempted from real estate tax.

3.2 Using GIS Technology to Simulate the Expropriation Process

Based on the above analysis, GIS technology is used to simulate the process of government collecting real estate tax. Based on the survey results, some Tianyuan streets are selected as tax areas. The housing types in this area include class I residence (Villa) and class II residence, and have many factors affecting house prices, such as location, greening, education, commerce and so on. After learning the housing location information, the corresponding record carrier is established through GIS system to realize the visualization of spatial relationship. The 10 housing information is assumed and the ownership is Guangzhou registered residence. The income method is adopted for the appraisal. GIS assisted appraisal predefines and calculates the mathematical model according to the selected appraisal method to provide the reference price of real estate. The free area is only for the first house of the owner, and the free area is not allowed from the second house.

The tax rate policy of five grades of excess accumulation system is implemented for the taxable area. The tax rate of 0.7% is adopted for the taxable area of class I residence of 50m² - 100m², and 1.1% is adopted for the taxable area of class II residence of more than 90m² and less than 120 m².

4 RESEARCH CONCLUSION

Taking GIS as the main research tool, this study selects representative blocks by using the data of block population density, economic development level and income level. At the same time, the replacement rate of real estate tax on land transfer fee is calculated by different tax rates and exempted areas based on the data of permanent population and the number of primary and secondary school degrees. Referring to the implementation methods of the current two pilot cities of real estate tax, simulate the policy rules and policy combination, and finally simulate the real estate tax collection process (Fan, et al, 2010).

In addition to legal principles and respecting historical traditions, the renewal and supplementary payment of land use right also needs to be based on economic principles, the concept of social equity and the specific practice of land system (Huang, 2018). Based on the land price theory, from the perspective of land policy and public policy, land taxation and social equity, and from the perspective of realizing social fairness and justice, reducing management costs and conforming to economic laws, China should abandon the policy orientation of continuing to pay the transfer fee according to the real-time market rent when the land expires, and amend relevant laws in time to make the use right of residential land long-term or even permanent, and adopt appropriate land tax policies to return the land value-added income to the state (Chen, et al, 2007, Zhu, 2016). The recovery of land appreciation should become the main value orientation of China's land policy in the future. Therefore, the three policies of differentiated low standard collection, consolidated real estate tax and land appreciation are more reasonable, especially land appreciation (Zhu, Fang, 2019).

No matter when the land use right expires, in the real estate transaction link, the evaluation institution entrusted by the government will calculate the land appreciation and recover 30% - 60% of the appreciation. If the appreciation is not increased, there is no need to make up the payment. The supplementary payment of similar land value-added

tax is only collected when the property right is transferred and expires. This method is different from the function of real estate tax. It should reflect the basic system of state ownership, and the price rise should be returned to the public. The land value-added tax paid during the period can be included in the historical cost accounting and deducted when making up the payment (Peng, 2016). In short, there is no value-added tax (transfer fee).

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