Research on the Influence of Property Tax Policy on Residents' Consumption Based on Difference-in-Differences Model

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Abstract
In recent years, housing prices remain high. In the meantime, the problem of excessive growth becomes increasingly serious. A series of socio-economic pain points brought by high housing prices have become key issues that the government needs to solve urgently. Continued high housing prices have seriously affected the consumption behavior of residents, bringing about changes in consumption scale and consumption structure. This paper presents a survey and a summary of recent research outcomes. First, the relevant literature is reviewed, focusing on the impact of property tax on the total per capita consumption expenditure of urban residents, as well as the heterogeneity effect of tax policies in Shanghai and Chongqing(the first two cities included in the property tax pilot). Second, this work summarizes the theoretical knowledge of property tax legislation, focuses on analyzing the theoretical mechanism of property tax affecting residents' consumption, and provides a theoretical basis for follow-up research. After that, the paper compares the current situation of property tax revenue and housing price changes in Shanghai and Chongqing, aiming to provide a realistic reference for the following analysis. Finally, this paper uses the difference-in-differences (DID) model to empirically test the property tax situation in both cities before and after the property tax reform in 2011. The impact of the reform in Shanghai and Chongqing is studied regarding residents' consumption. Suggestions are put forward for the improvement of the property tax policy implemented later. The results show that a rise in property tax will lead to an increase in the consumption expenditure of urban residents.

Keywords: *Property tax; Resident consumption; DID model*

1. Introduction

1.1. Research Background

Property tax is an important tool for the government to regulate the real estate market and the social and economic distribution. In most western countries, property tax has become an important source of local fiscal revenue and plays a pivotal role in local development. At present, property tax is still at the pilot stage in China, and society pays much attention to the future legislation of property tax. During the two sessions in 2018 and 2019, Premier Li Keqiang stated in the government work report to "promote property tax legislation". On January 28, 2011, Shanghai and Chongqing became the first property tax pilot cities in China. The purpose of the pilot cities is not only to achieve stable local fiscal revenue and adjust the income distribution of residents, but also to restrict investment and speculation in the real estate market through property tax and curb the polarization of housing consumption. In such context, the research on the experimental results is expected to provide a reference for the extensive implementation of property tax policies across the country. Considering the low consumption rate in China, this paper studies whether property tax reform is conducive to improving the living welfare of residents and evaluates the property tax pilot from the perspective of residents' consumption.

China carried out a housing system reform in 1988. In 2003, the government issued a statement affirming the status of the real estate industry as the backbone of the economy. With the support of national governments, the real estate industry is booming. However, the rapid development of the real estate industry has not only stimulated people's demand for living in houses, but also

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made its role biased as an investment product, where people make investments for high returns. The growth of investment demand has led to the rapid rise in housing prices, especially in economically developed regions such as Beijing, Shanghai, Guangzhou, and Shenzhen. Housing prices in these cities have caught up with or even surpassed many developed countries. Data from the National Bureau of Statistics show that, nationwide, both the sales amount and the average prices of commercial real estate in China rose gradually over the past decade. In particular, in 2009, the average price of commercial housing increased by 23.18%, and the average price of residential buildings rose by 24.69%. The growth rates in 2016 and 2018 were higher than 10%. Meanwhile, housing prices in the first-tier cities of China are much higher than the national average, which makes the rapid growth of today's cities is accompanied by the uneven development and some other kinds of problems.

TABLE 1 The average housing price in China and the growth rate

Year	Commercial housing sales (0.1billion yuan)	Growth rate (%)	Average selling price of commercial housing (Yuan/m^2)	Growth rate (%)	Average selling price of residential commercial housing (Yuan/m^2)	Growth rate (%)
2009	44355.17	76.94%	4681	23.18%	4459	24.69%
2010	52721.24	18.86%	5032	7.50%	4725	5.97%
2011	58588.86	11.13%	5357	6.46%	4993	5.67%
2012	64455.79	10.01%	5791	8.10%	5430	8.75%
2013	81428.28	26.33%	6237	7.70%	5850	7.74%
2014	76292.41	-6.31%	6324	1.39%	5933	1.42%
2015	87280.84	14.40%	6793	7.42%	6473	9.10%
2016	117627.05	34.77%	7476	10.05%	7203	11.28%
2017	133701.31	13.67%	7892	5.56%	7614	5.71%
2018	149614.42	11.90%	8726	10.57%	8553	12.33%
2019	159725.12	6.76%	9310	6.69%	9287	8.58%
2020	173612.66	8.69%	9860	5.91%	9980	7.46%

Source: National Bureau of Statistics

Rising housing prices have increased the pressure on residents' daily lives. Faced with the high housing prices and the burden of monthly loans, people tend to reduce their disposable income and consumption expenditure and increase their savings. As a result, it leads to a problem of weak consumption growth in the whole society. Since 2000, the overall consumption level of Chinese residents has shown a steady downward trend, especially in recent years. In 2012, there was a notable sharp decline. The phenomenon of insufficient consumption growth has become an important issue that needs to be addressed to maintain stable economic and social development. Therefore, in recent years, the government has introduced relevant policies to keep house prices at a reasonable level. However, neither the purchase restriction policy nor the method of adjusting the down payment ratio has been able to effectively reduce housing prices or balance the commercial housing prices, with a failure in stabilizing the commercial housing market. The low consumption caused by high housing prices will be really likely to have a negative impact on economic development and become a major potential danger restricting economic development in the future. Therefore, the impact of the real estate industry on the economic behavior of residents remains an important aspect that the government needs to focus on.

To deal with the aforementioned problems of high and fast-rising housing prices, the government tried to adjust the current prices by means of the property tax policy. In 2011, Shanghai and Chongqing were selected as the pilot cities for property tax reform in China for the first time. The property tax reforms in these two cities put forward new policies for individual housing, providing new ideas to stabilize housing prices, so as to improve the residents' welfare. In recent years, there have been many reports of property tax pilots in other cities across the country, but none of them has been implemented, because policymakers are aware of the controversy over property tax reform and the shortcomings revealed in Shanghai and Chongqing. Therefore, it is necessary to conduct further research on the impact of property tax on individual housing in Shanghai and Chongqing. There is a practical need to improve the design of the property tax policies.

1.2. Significance of research

The reform policies of Shanghai and Chongqing property tax pilots involve personal housing for the first time, which is conducive to the optimization of China's tax structure. Using the data from the pilot cities, this work conducts an empirical study on the impact of property tax reform on urban residents' consumption expenditure. It is helpful to fill the gap in the related research field and improve the existing property tax system. At present, sluggish consumption cannot strongly stimulate economic growth. By contrast, it restricts economic development, which hinders China's consumption-driven economic transformation. In the current economic transformation period, the problem of insufficient consumption needs to be solved urgently, and future economic development needs to be driven by the growth of consumption expenditure. Therefore, for a long

time, the central government has been trying to regulate the real estate market through property tax reforms and deal with the real estate bubble and macroeconomic downturn. By studying the relationship between property tax and consumer spending, and making attempts to correctly handle the relationship between property tax and consumer spending, the government can optimize the property tax and taxation systems and promote reasonable growth in consumption and economic development. Furthermore, by improving the property tax policy, taxation will play a regulatory role in the real estate economy.

1.3. Research method

Literature research method: This work searched the resource database about property tax policies issued in the past and their impact, utilized the websites of local taxation bureaus and the National Bureau of Statistics to find relevant tax policies, and used the Internet and other researches made by scholars to search for specific explanations of the policies.

Empirical method: This paper adopted the DID model to empirically test the property tax situation in Shanghai and Chongqing before and after the property tax reform in 2011, and studied the specific impact of the property tax reform in Shanghai and Chongqing on residents' consumption. Finally, the paper analyzed the influence mechanism of property tax and residents' consumption based on the practical situation of Shanghai and Chongqing and put forward future directions and suggestions for China's property tax reform.

2. LITERATURE REVIEW

2.1. The indirect effect of property tax on consumption through housing price

Most people agree that the effect of property tax has an obvious effect on restraining the rise of house prices. However, some scholars believe that the policy effect of levying property tax on housing prices is not obvious, and may even cause house prices to rise.

H. A. Simon and D. Netzer [1] [2] pioneered simultaneously considering property tax and housing price changes in the analysis. They argued that if capital flows freely and returns are fixed, consumers will pay the full amount of property taxes. Hamilton [3] examined the relationship between housing prices, property taxes, and government spending by considering the partitioning factors of empirical research. Research showed that the impact of introducing property tax on housing price growth is mainly achieved by increasing government public expenditure, and demonstrated that the local governments will use the collected property tax to develop infrastructure. It improves local public services and facilitates the increase in housing prices. Furthermore, Mieszkowski [4] proposed that property taxes interfere with resource allocation. These scholars divided the studies into high and low economic zones based on the tax rate. The conclusion is that capital will use the tax rate difference to flow between the high and the low zones. It will lead to misallocation of capital and distortion of capital use inside the region. As a result, capital owners bear part of the tax, while production factor owners and consumers bear another part of the property tax. The two situations caused a certain degree of housing price rise and affected the efficiency of resource allocation in the real estate market. Fischel [5] conducted a study using the Tiebout model and found that property tax is positively correlated with housing price changes.

Some Chinese scholars also agree with the above point of view. For example, Dai [6] studied the impact of property tax on housing prices in the holding sector, and the findings showed that the property tax in the holding sector can suppress housing prices in the short term. In the long term, due to the rigid demand for residential housing, the property tax has little effect on housing prices, which will continue rising in the long run. Liu et al. [7] used the (M+nR) game model to analyze how the introduction of property tax impacts on market demand and housing prices. According to the study, there is a positive relationship between housing prices and the property tax rate. Based on 10 years of data on commodity housing prices and fixed assets in Shanghai from 2006 to 2016, Wang [8] examined the empirical model and drew the conclusion that the property tax has a positive effect on the housing prices, that is, the collection of the property tax will push up housing prices. On the contrary, some scholars agree that the property tax has no inhibitory effect on housing price changes or lower housing prices.

Rosen et al. [9] used an empirical model to analyze the negative correlation between property taxes and housing prices, and recognized the role of property taxes in reducing housing prices. McDonald [10] confirmed the effect of property tax on housing price reduction. Oates [11] studied the data from 53 towns in the United States and found that the value of the local real estate is inversely related to the total amount of property taxes. Krantz et al. [12] also examined the opposite trend of property taxes and housing prices. Muellbauer [13] argued that the effect of property taxes on housing prices is related to the elasticity of supply. When housing supply is inelastic, housing prices can fall significantly due to taxes.

2.2. Property tax directly affects residents' consumption

The property tax directly affects residents' consumption mainly by affecting the residents' budget constraints. The introduction of the personal housing property tax has an obvious impact on the residents'

budget constraints. In such context, this paper summarized the opinions of Chinese scholars on the post-2011 housing tax pilot policies in Shanghai and Chongqing. J. F. McDonald. [10] believed that levying additional property tax on individual housing will harm the welfare of property buyers and is not conducive to consumption upgrades. The government should pay attention to the impact of taxation on taxpayers' welfare when formulating tax policies. Mao et al. [14] established a GEM model, mainly to study the impact of property tax on the macroeconomy. Research showed that raising property taxes will significantly reduce household consumption and have a great impact on saving households. Richardson et al. [15] divided resident consumption into different types for research. The results showed that the property tax pilot policy had no significant effect on the overall consumption of residents. For development-oriented consumption, the property tax pilot had significantly reduced household consumption expenditure, and the decline was greater. In addition, the property tax has a negative impact on the increase in living consumption. Hu et al. [16] used the CGE model to study the relationship between property tax and residents' consumption. They believed that the levy of property tax has different effects on residents of different income levels, among which the consumption inhibition effect on high-income groups is the most obvious, while the consumption of middle- and low-income groups is less affected by the policy. Du et al. [17] adopted the DID model and used the panel data from 2006 to 2017 to empirically study the relationship between property tax and resident consumption. The results showed that the effect is uncertain, yet it is still an important means to adjust income.

3. THEORETICAL BASIS OF PROPERTY TAX

3.1. Necessity of property tax collection

In China's current tax system structure, property tax constitutes a major proportion. The collection of property tax plays a pivotal role in regulating the macro-economy and ensuring the level of local public service. In 2011, China launched a pilot property tax policy in Shanghai and Chongqing, which increased the supervision of individual housing taxes, but the current property tax policy in other parts of the country continues to follow the 1986 Regulation 2. The so-called 1986 Regulation 2 is based on the “Provisional Regulations of the People's Republic of China on Property Tax” promulgated by the State Council in 1986, which came into force on October 1 of the same year. The Regulation demanded the property tax be levied on business properties and collected from property owners based on the property’s taxable residual value or rental income. The current property tax system has been implemented for more than 20 years. With the passage of time, some systems cannot adapt to the new development needs and therefore, adjustment and reformation are required.

The regulation of excluding personal non-profit housing tax is no longer suitable for the current economic development, and the reform of property tax and the improvement of the property tax system are general trends. According to the experience of the reform effect in the pilot regions, the promotion of the personal housing property tax legislation is conducive to accelerating the prosperity and progress of China's real estate market, narrowing the gap between the rich and the poor, as well as maintaining social stability and harmony.

From the perspective of tax fairness, property tax includes not only the horizontal and vertical fairness of taxation but also the equality of income distribution adjustment. First, the property tax requires people with nearly the same living conditions to have no difference in taxation, but also people with different ones be treated differently. In the process of tax collection, not only the tax burden but also the taxpayers’ financial status should be considered comprehensively. Second, the property tax requirements play a role in regulating the income distribution of residents. In China's current tax system structure, the function of adjusting income distribution is mainly undertaken by the income tax, while the property tax can be a useful supplement to income tax adjustment, especially those in the possession link. It is one of the most direct and effective means to adjust income distribution. At the same time, as an indispensable part of personal wealth, the occupation of property tax reflects the individual’s economic ability and tax-paying ability. Optimizing the collection of property tax will help to adjust the distribution of social wealth and avoid excessive concentration of social wealth. From both aspects, it is particularly important to improve property tax policies.

3.2. Theoretical analysis of the impact of property tax on residents' consumption

The influence of property tax on residents' consumption is mainly reflected in the "income effect" and "substitution effect". The income effect can be explained from two aspects: total fiscal revenue and individual income distribution. First of all, from the perspective of total fiscal revenue, property tax is one of the local tax sources, and it is a constant source of rich revenue for local finance. It is easy for local governments to collect and manage with lower costs and difficulty. At the same time, the visibility and immobility of real estate make the property tax source sufficient and stable, ensuring the sustainability of property tax revenue. Local governments can collect revenue and redistribute it to influence residents' consumption. In addition, the government can redistribute the real estate industry by imposing a property tax. The government redistributes property taxes through transfer payments and public

services and uses the collected property taxes for infrastructure construction, education, healthcare, public goods, and public services. First of all, the government is committed to investing the collected property tax in education and medical care, which will help reduce the expenditure of low-income groups in the area, thereby increasing their current disposable income to a certain extent. Secondly, the government can use the property tax to build affordable housing, which will help reduce the cost of living for taxpayers. Finally, due to the basic characteristics of public products and services, low-income groups only need to pay little property tax to share the benefits of taxation. This to a certain extent reflects the inclination of social resources to low-income groups. It will directly increase the disposable income of this group and have an impact on their consumption. This process reflects the optimal allocation of resources. With the increase in the supply of public goods and services, the living standards and welfare of local residents will be improved, making the residents inclined to live and develop there, thereby driving the development of the local economy.

Then, the introduction of the property tax will change the income distribution of residents and affect the consumption level through changes in income. How and how much disposable income is affected depends on the design of the property tax system. For example, the property tax reform in Chongqing focused on the collection of high-end residential buildings, and the tax rate is progressive. As a result, the increase in property value and the more the property tax will increase the cost of property ownership, and thus have a great impact on the consumption level of residents.

4. METHODOLOGY

For empirical analysis, this paper adopts an econometric method of DID, which has become popular in the field of public policy and project implementation effects in recent years. DID has the advantage of being able to better evaluate the net effect of a policy. The core of this method is to treat the implementation of public policy as a natural experiment, that is, to exogenously select all subjects and divide the sample into two groups: a treatment group that is affected by the policy and a control group that is not affected by the policy. First, the difference in the corresponding indicators of the treatment group before and after the policy implementation is calculated. Second, the difference between the indicators in the control group before and after the implementation of the policy is calculated. Finally, the differences are subtracted to obtain a multiplier, which is the net effect of the policy on the treatment group.

According to the research results of domestic and foreign scholars, it is found that most scholars believe that the main factors affecting housing prices include demographic factors, inflation rate, fixed asset investment, local financial level, and wage income level. The factors that affect housing prices also vary. In the theoretical analysis, by studying the influence mechanism, it is found that property tax mainly affects housing prices through housing demand and supply. To simplify the research method, this study only focuses on the relationship between property tax and house price and does not consider other intermediary variables.

The data used in this paper are mainly from the China Urban Statistics Yearbook and the National Bureau of Statistics database. The author collated the relevant data of the treatment and the control groups from 2011 to 2020. To comply with the comparability of the data, the quantitative data involved in this paper are all based on the ConsumerPriceIndex published each year, with the year 2011 as the baseline.

As mentioned in the introduction to the DID approach, there is an important assumption when using it, which is, all the differences between the treatment and the control samples do not change before and after the exogenous event, except for the exogenous variables. This premise also means that intrinsic differences between the cities in the sample remain the same before and after the imposition of the personal property tax. Therefore, it is necessary to discuss the reasons for the differences between cities. Inter-city differences are the differences between cities in the sample before the imposition of the personal property tax. A large part of the difference between cities is due to the differences in the level of urban economic development and industrial structure, and the impact on the level of property prices is different. A series of macroeconomic indicators are used to reflect this phenomenon.

On the other hand, urban differences can also be due to differences in macroeconomic policies between regions, such as land supply policies, bank loan policies, and purchasing restrictions. There are other factors that are difficult to be observed, but may also cause differences in cities, such as the history and culture of the city, the general quality of the population, and the attitudes of consumers. They in turn have an impact on the real estate market. While it is unlikely that these indicators will be numerically the same in a cross-sectional or longitudinal comparison before and after the personal property tax window that is examined, it can be assumed that the differences in housing price changes due to the changes in these indicators between the treatment and the control groups are relatively stable in the short term. This is because the macro environment is not formed in such a short period of time.

Generally speaking, the macroeconomic environment does not change significantly in a relatively short period of time. Therefore, individual cities affected by the macroeconomic environment develop steadily, and there will not be a large disparity in the short term. To better

meet the assumptions of the double-difference method, more accurate results will be obtained by controlling various macroeconomic variables contained in the urban differences. However, for some special variables that are difficult to observe, such as the macroeconomic policies issued by the government, the purchase restriction policies, and the history and culture of the city, it is difficult to collect specific values. To deal with this, a method is adopted where a group of cities with similar internal and external development conditions were selected as the control group.

5. EMPIRICAL ANALYSIS

5.1. Status quo of property tax pilot in Shanghai and Chongqing

1) Status quo of tax revenue

TABLE 2 The tax situation after the property tax reform

Year	Total local tax revenue of Chongqing (0.1 billion Yuan)	Property tax of Chongqing(0.1 billion Yuan)	Proportion (%)	Total local tax revenue of Shanghai (0.1 billion Yuan)	Property tax of Shanghai(0.1 billion Yuan)	Proportion (%)
2011	881.07	20.89	2.37%	3172.72	73.66	2.32%
2012	970.17	27.43	2.83%	3426.79	92.56	2.70%
2013	1112.62	31.4	2.82%	3797.16	93.05	2.45%
2014	1281.83	40.37	3.15%	4219.05	99.95	2.37%
2015	1450.93	52.46	3.62%	4858.16	123.81	2.55%
2016	1438.45	56.88	3.95%	5625.9	170.96	3.04%
2017	1476.33	64.9	4.40%	5865.51	203.69	3.47%
2018	1603.03	67.33	4.20%	6285.04	213.84	3.40%
2019	1541.22	73.15	4.75%	6216.29	216.83	3.49%
2020	1430.72	71.74	5.01%	5841.88	198.75	3.40%

Source: National Bureau of Statistics

As can be seen from Table 2, since the implementation of the policy, the property tax in the two places has increased year by year. However, as the main tax revenue of local governments, the tax has accounted for less than 10% in recent years. Moreover, the property tax revenue includes both the national unified tax revenue and the pilot tax increase. Therefore, the tax revenue from the property tax reform in both places is less than the total property tax revenue reported. This shows that the levy of the property tax has little impact on residents' consumption by increasing fiscal revenue.

2) Status quo of housing price

In recent years, housing prices have risen fast, bringing increasing housing pressure on residents. The government has to stabilize housing prices at a certain level through measures such as purchase restrictions. At this time, people focus on the function of stabilizing the housing price on the property tax reform implemented in Shanghai and Chongqing. It is hoped that higher property tax will reduce the housing price and increase disposable income. As shown in Figure 1, after the implementation of the policy, housing prices in Chongqing experienced negative growth in 2014 and 2015, while housing prices continued to rise gradually over the previous year. After 2015, housing prices in Chongqing showed a positive growth trend. The trend in Shanghai is similar to that in Chongqing, but from the position of the peaks and troughs, it can be seen that the fluctuation frequency of the housing process in Shanghai is higher than that in Chongqing.

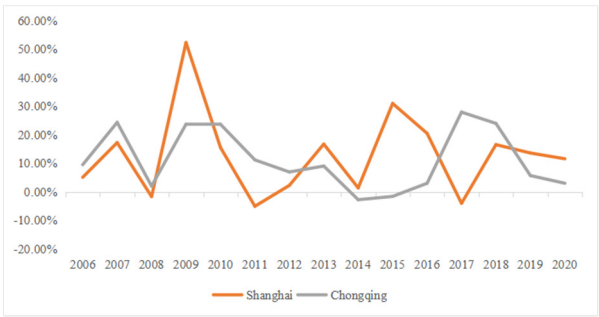

Figure 1 Housing prices growth rate in Chongqing and Shanghai

This paper examines the impact of the personal property tax on housing prices. If it is assumed that housing demanders have fully foreseen the introduction of the personal property tax pilot, they will adjust their housing demand in advance according to the expectations, so that housing prices after the implementation of the personal property tax pilot have been adjusted. The change in housing prices at this time cannot be said to be entirely caused by the imposition of the personal property tax. Generally speaking, it is difficult to form a complete expectation of the policy in a real environment. According to the reality of China's real estate market at the time, the policy expectations of investors on the pilot of personal property tax were mainly in 2010. On March 24 of the same year, the government announced that the city had submitted a special property consumption tax to the State Council for approval. The new regulation has sparked investor expectations for a personal property tax, which was reflected in the continued decline in Chongqing's housing price growth in 2010.

There are many reasons why the rise of housing prices in the same city fluctuates and there will be obvious peaks and troughs. It is reasonable to interpret the trough in 2010 as a property tax effect. However, subsequent rises and falls depend more on macroeconomics and expectations. Compared with Shanghai, Chongqing's GDP and Engel's coefficient are significantly lower, and its residents' housing consumption and investment capabilities are significantly lower than those of Shanghai residents, which led to less volatility in house prices than in Shanghai.

3) Status quo of consumption expenditure of urban residents

As shown in Figure 2, per capita disposable income and per capita consumption expenditure in Shanghai and Chongqing changed to different degrees. However, in just a few years after the implementation of the property tax in 2011, the growth rate of residents' disposable income was not as fast as the reform, and the gap between residents' disposable income and consumption expenditures tended to widen. As for Shanghai, the growth rate of per capita consumption expenditure of urban residents slowed down before 2015. But after 2015, the two indicators returned to almost the same trend. Since the introduction of the policy, the per capita consumption expenditure in Chongqing has grown steadily. As can be seen from Figure 2, the per capita consumption expenditure of urban households in Shanghai dropped significantly in 2020, but not in Chongqing.

TABLE 3 Consumption expenditure of urban residents in Shanghai and Chongqing

Year	Per capita consumption expenditure of urban households in Shanghai	Per capita disposable income of urban residents of Shanghai	Per capita consumption expenditure of urban households of Chongqing	Per capita disposable income of urban residents of Chongqing
2005	13773	18645	8623	10243
2006	14762	20668	9399	11570
2007	17255	23623	9890	12591
2008	19398	26675	11147	14368
2009	20992	28838	12144	15749
2010	23200	31838	13335	17532
2011	25102	36230	14974	20250
2012	26253	40188	16573	22968
2013	32447	44878	17124	23058
2014	35182	48841	18279	25147
2015	36946	52962	19742	27239
2016	39857	57692	21031	29610
2017	42304	62596	22759	32193
2018	46015	68034	24154	34889
2019	48272	73615	25785	37939
2020	44839	76437	26464	40006

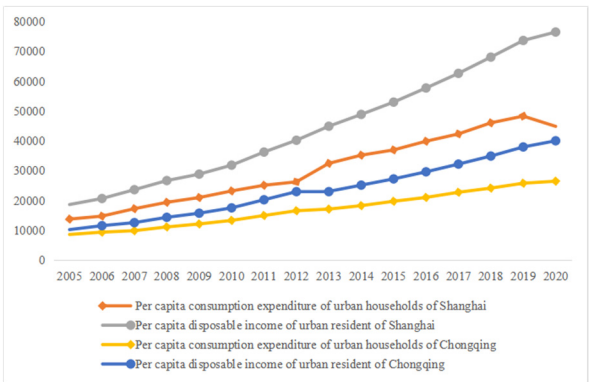

Figure 2 Consumption expenditure of urban residents in Shanghai and Chongqing

5.2. Empirical analysis of the impact of property tax reform on residents' consumption expenditure

5.2.1. Model establishment

The DID model has good applicability in analyzing policy effects. Therefore, it is used as the econometric equation to evaluate the policy effect of the housing tax pilot on residents' consumption. The basic model is shown in Formula 1.

$$Y_{it} = \alpha_0 + \alpha_1 di + \alpha_2 dt + \alpha_3 di \cdot dt + \varepsilon_{it} \quad (1)$$

Where, d_i denotes the policy dummy variable. If individual j is affected by the policy implementation, individual j belongs to the treatment group, and the corresponding dt-value is 1. Otherwise, individual j belongs to the control group, and the corresponding di-value is 0. dt denotes the time dummy variable. It is 0 before the policy is implemented and is 1 after the policy is implemented. $di \cdot dt$ denotes the interaction term of the policy dummy variable and the time dummy variable.

5.2.2. Variable selection and data sources

Explained variable: This paper studies the impact of property tax on urban residents' consumption expenditure, so the per capita consumption expenditure (PCE) of urban residents is selected as the explained variable.

Explanatory variables: According to the DID model, the explanatory variables are policy dummy variables and time dummy variables.

Control variables: There are many factors that affect the consumption expenditure of urban residents. This paper combines the absolute income hypothesis and relative income hypothesis and other traditional economic theories. Urban residents' per capita disposable income (PCDI), urban residents' RMB savings deposits balance (SD), urbanization rate (UR), per capita GDP (PGDP), the share of the tertiary industry (STI), and the average selling price of residential commercial housing (RHP) are selected as control variables. In such a setup, the DID model becomes:

$$lnPCE = \beta_0 + \beta_1 di + \beta_2 dt + \beta_3 di \cdot dt + \beta_4 lnPCDI + \beta_5 lnSD + \beta_6 lnUR + \beta_7 lnPGDP + \beta_8 lnSTI + \beta_9 lnRHP \quad (2)$$

The data in this paper are mainly from the relevant data of Shanghai and Chongqing from 2005 to 2020.

5.3. Empirical test

As can be seen from Table 4, R-squared equals 0.997, indicating that the model fits well. The coefficient of DID is 0.0101, which passed the 0.05significance level test. This shows that the property tax has indeed had an impact on the consumption expenditure of urban residents. The

impact is that the increase in the property tax will increase the consumption expenditure of urban residents. In addition, the coefficient of PCDI is 0.573, which passes the 5% significance level test, indicating that the per capita disposable income of urban residents is proportional to the consumption expenditure of urban residents. This is in line with people's expectations. Among other control variables, only the urbanization rate passes the 10% significance level test, which is inversely proportional to the consumption expenditure of urban residents.

Table 4 Empirical result

VARIABLES	PCE
DID	0.0101**
	(0.2296)
PCDI	0.573**
	(0.235)
SD	0.378
	(0.223)
UR	-0.485*
	(0.243)
PGDP	-0.156
	(0.108)
STI	0.427
	(0.378)
RHP	-0.0296
	(0.0644)
Constant	2.409*
	(1.385)
Observations	32
R-squared	0.997

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1. Conclusions

Based on the DID method, this paper studies the impact of the property tax on the consumption expenditure of urban residents in Shanghai and Chongqing, which were listed as the real estate reform pilot in 2011. Based on the relevant data from Shanghai and Chongqing from 2005 to 2020, empirical research finds that the property tax reform will have a positive impact on the consumption expenditure of urban residents. Combined with the theoretical analysis in section III, this paper argues that the reason for this phenomenon lies in the way of government transfer payment and the way of public service distribution. Property taxes are applied in the fields of infrastructure construction, education, medical care, public products, and public service. It will help reduce the expenditure of low-income groups, thereby increasing their disposable income to a certain extent. In addition, the government can use the collected property tax to build affordable housing, which will help reduce the living cost of taxpayers, thereby increasing disposable income, and the increase in disposable income will lead to an increase in the consumption income of urban residents.

6.2. Policy recommendations

First of all, the property tax policy should be based on the actual local economic situation, taking into account the differences in the local population, urbanization, and other factors. The implementation of the policy should be adapted to the local household registration system and educational level, lest the government pay too much attention to the real estate market and ignore the development of other regions. Secondly, the optimization of property tax is inseparable from supporting policies, as the impact on residents' welfare is not only related to the implementation of the tax, but also the education, medical and social security systems of each region. In the future, the property tax policy of the national reform needs to take into account all aspects of each region, effectively safeguard the vested interests of residents, make the taxation truly beneficial to the country and the people, and promote the growth of domestic demand. Finally, the property tax policies in each region should pay more attention to consumption upgrades. The government needs to continuously adjust the property tax policy while stabilizing the real estate market and improving the vitality of the regional economy, so as to promote the high-quality development of consumption in each region. In such a context, the following policy recommendations are put forward.

1) The scope of taxation should be broadened

The "narrow tax base" in the pilot areas will be taxed primarily on high-income groups, who will buy fewer high-end houses due to rising carrying costs. In the long run, this will make the structural imbalance of the housing market structure more serious, which is harmful to the overall stability of the real estate market. In addition, property tax in the Shanghai mode is only taxed on incremental properties, with a narrow tax base. A narrow tax base may inhibit the regulation effect of property tax to a certain extent and have an impact on the long-term economic development and the increase in fiscal revenue. Therefore, it is necessary to expand the tax base and the objects of taxation, and include urban and rural incremental real estate and stock real estate into the scope of taxation.

2) Differential floating tax rates shall be applied

Due to the differences in economic development in different regions, the tax rates in the pilot areas are relatively single, and the taxpayers cannot be properly classified through step classification. Local governments should set different tax rates for different cities. For cities with different levels of development and different degrees

of land use, differential property tax rates should be implemented to promote the rational allocation of resources. The upper and the lower limits of the tax rates are determined by the central government, such as 1%-3%, and the determination of the specific applicable tax rates should be delegated to local governments (provincial-level governments). At the same time, the higher tax rate for high-end housing reflects the government's control over the consumption by high-income groups. Lowering the tax rate on ordinary housing can increase the welfare of low-income groups, and tax-free or tax-reduced policies for affordable housing will help promote local livelihood construction. In summary, the design of tax rates can promote regional consumption upgrades only when taking into account the role of property tax in regulating the market and not bringing greater tax pressure to the public.

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