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Property Tax, Home Purchase Restriction, Expectation and Housing Price: An Empirical Study of 35 Large and Medium-sized Cities in China

Author(s)

Ruijie Cheng, Lee Kuan Yew School of Public Policy, Singapore, r.cheng@u.nus.eduFirst

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Property Tax, Home Purchase Restriction, Expectation and Housing Price: An Empirical Study of 35 Large and Medium-sized Cities in China

Ruijie Cheng

Abstract:
In this study, I examine the effects of the expectation, home purchase restriction policy starting from 2010 and the trials of property tax reform in Shanghai and Chongqing carried out in February 2011 through conducting a pooled OLS and fixed effect panel regression analysis based on 35 large and medium-sized Chinese cities by adopting monthly data from 2007 to 2011. I find that home-purchase restriction policy significantly reduces the housing prices by 1.2 per cent according to pooled OLS regression model estimation and the property tax trial in Chongqing significantly reduces the housing prices by 1.7 per cent, while the property tax trial in Shanghai has a significant positive effect on the housing prices, robust to pooled OLS model and fixed effect model estimations, suggesting a policy failure in the experiment in Shanghai. Expectation significantly contributes to the large proportion of the increase in the housing prices, more than 80 per cent rise in the housing prices can be explained by the expectation.

Key words: Housing Price; Property Tax; Restriction Policy; China; Fixed Effect.

1. Introduction

After the housing bubble burst of 2008 in the United States and the consequent global financial crisis, attentions has been attracted to the risks in the real estate market. Particularly, during the past decade, property prices have been experiencing a dramatic and uninterrupted increase in Chinese housing market and the upsurge housing price has been a public concern as many ordinary buyers especially a younger generation who need housing for basic living cannot afford to purchase one in big cities like Beijing, Shanghai, Guangzhou or Shenzhen. For example, from 2003 to 2013, in Beijing, Shanghai, Guangzhou and Shenzhen, the housing prices experienced an annual real growth rate of 13.1% on average, which grew at a much faster rate than the growth rate of gross regional production per capita and urban disposable income per capita[1].

1) Recent development in Chinese housing market

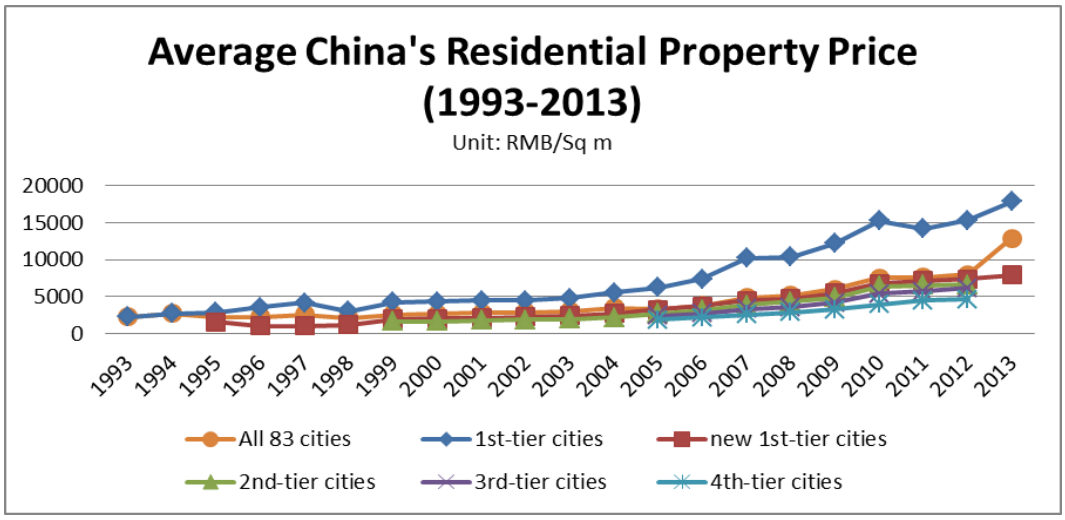
The following figure 1 reflects the average China's residential property price from 1993 to 2013. It demonstrates the trend of the housing price of these 83 Chinese cities of above medium-sized level over the available time period. There are six lines in the figure, respectively illustrating the development and fluctuations of the house prices performance of all 83 Chinese cities overall and five groups of First-Tier, New First-Tier, Second-Tier, Third-Tier and Fourth-Tier Cities[2].

[1] Hanming, F., Quanlin, G., Wei, X., Li-An, Z. (2015, May 27). *China's housing boom*. http://voxeu.org/article/china-s-housing-boom.

[2] Note: Since there is no standard classification or ranking criteria for different tiers according to Chinese official statistics, here a survey published by China Business Network Weekly in 2013 intended to re-group all 400 Chinese cities is referred. The ranking criteria of this survey was based on a comprehensive consideration

The First-Tier Cities include Shanghai, Beijing, Shenzhen and Guangzhou. The New First-Tier Cities include Tianjin, Hangzhou, Nanjing, Chengdu and other 12 cities. The Second-Tier Cities include Hefei, Wuxi, Suzhou, Ningbo and other 25 cities. The Third-Tier Cities include Guilin, Foshan and other 24 cities. The Fourth-Tier Cities include Anshan, Jilin and other 18 cities. Remaining small towns or prefecture-level cities are left out of considerations. This ranking of Chinese cities may not be comprehensive, however it provides an overview on the general development and it gives a glimpse of regional inequality of Chinese housing market.

Figure 1: Average China's Residential Property Price (1993-2013)



Source: Own Demostration, caculated based on the data from CEIC (1993-2013).

From the figure 1 above, we can tell that the economically more advanced cities, i.e., the first-tier cities, experience faster price increases, while the cities at lower tiers experienced more moderate price increases during the past two decades. In 2012, the average residential property price among first-tier cities was 15,355 Yuan per square meter; it was 7,372 Yuan per square meter among 12 new first-tier cities, 6,577 Yuan per square meter for 25 second-tier cities and 6,184 Yuan per square meter for 24 third-tier cities and for 18 fourth-tier cities, the average level of price fell at 4,596 Yuan per square meter. The price for first-tier cities was far greater than those of less developed cities and regions.

The house price-to-monthly income ratio is one of the basic affordability measures. It is the ratio of the average house price over the average monthly disposable income. This indicator measures whether housing is affordable for the average citizen. Wei et al. (2012) and Wei and Allen (2010) provide data on the ratio of median housing value to median monthly household income to be over 84 in China (or 89 in the urban areas) compared with the ratio in the United States of

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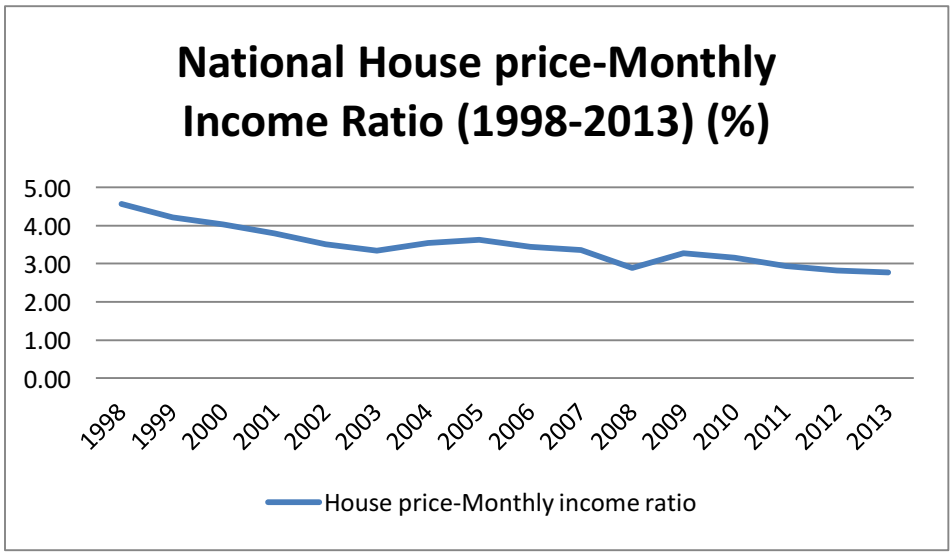
of conventional factors such as GDP, population size, per capita income, as well as new indicators from the perspective of private sector, such as the number of "211" colleges and universities one city owns, the number of top 500 enterprises located, airport handling capacity, the number of international routes, etc. See http://www.yicai.com/news/3236894.html (in Chinese) for the criteria of classification.

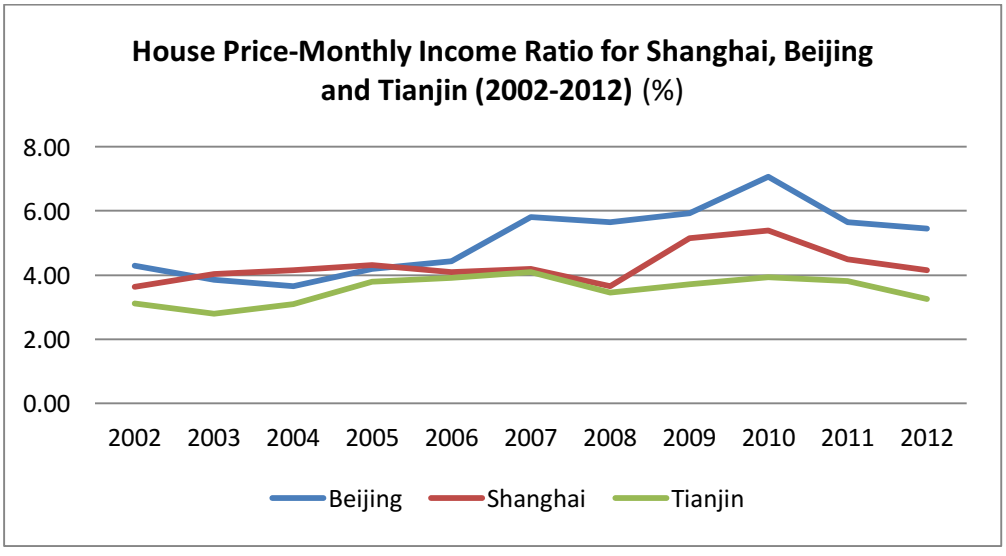
around 50 even before the 2008-2009 crisis. Below is Figure 2 reflecting the development of national house price-to-monthly income ratio from 1998 to 2013 calculated based on the data from the China's Yearbooks. It shows a moderate decrease of the ratio at the national level which means the property becomes affordable. However, when we look at specific-city cases like Beijing, Shanghai and Tianjin, we can detect a clear increase of the ratio in all three cities before 2010 shown in the figure 3.

Figure 2: National House Price –Monthly Income Ratio (1998-2013)



Source: Own Demostration, caculated based on the data from China's Statistical Yearbooks.

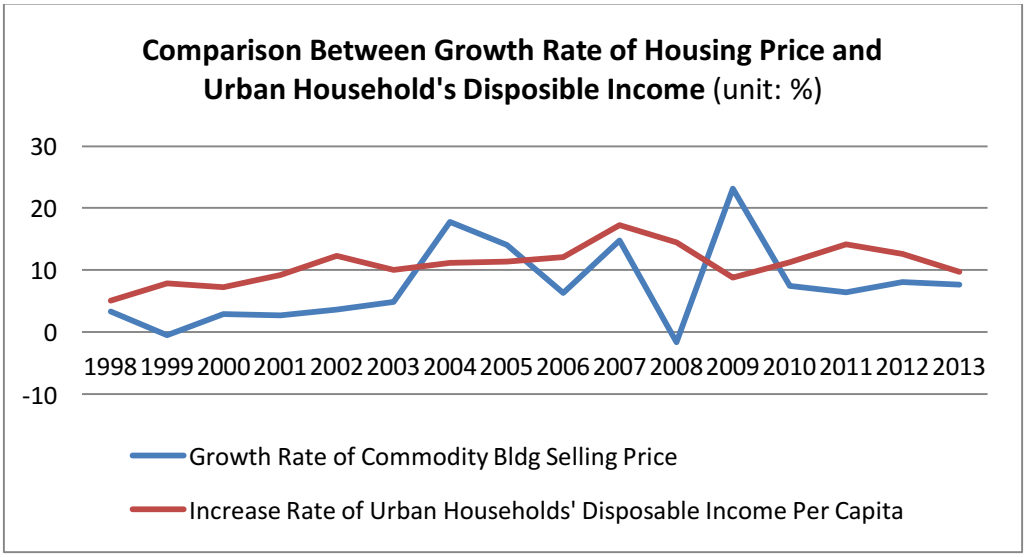
Figure 3: House Price-Monthly Income Ratio for Shanghai, Beijing and Tianjin (2002-2012)



Source: Own Demostration, caculated based on the data from CEIC database.

Even though the price-income ratios for both national level and for these three major cities went down during recent several years especially after 2011 which indicated the trend of housing becoming more affordable. Very often the growth rate of property price was a lot higher than the increase rate of households' disposable income for the last decade, especially between 2008 and 2011 (see Figure 4 below). The growth of disposable annual income has fallen below the growth in housing prices by the end of 2009.

Figure 4: Growth Rate of Housing Price and of Urban Household's Income (1998-2013)



Source: Own Demostration, caculated based on the data from CEIC database.

2) Institutional background and literature review

There are four stages in general in developing China's housing market: no market under centralized planning; initial reforms; marketization; regulation and policy interventions to cool down the market.

During the first stage, from 1949 to 1978, Chinese housing market was highly centralized. Chinese government was in charge of all the distribution of properties and all housing was owned by the State. Housing was regarded as a welfare policy as employees who were allocated a housing only needed to pay a nominal rent and the State subsidized the rest through government budget. However, residents only enjoyed possession and use, but had no rights to trade.

From 1978 to 1998, the government carried out a series of initial reforms, including a legal foundation was set in 1988 for private development in housing market and encouraging government employees to purchase public housing, and for those public housing to be sold at their cost price could move into market transaction after five years or so; designing a new mechanism for housing investment being shared by the State and households; developing housing funds, etc. The urban land was still owned by the State at this stage, while buyers

enjoyed 70-year land use right. However, during this period, housing market was still not established completely and it still had the feature of a welfare policy.

From July 1998, the blueprint of reforming the urban real estate development was clarified by the central government, which marked the beginning of the housing marketization in China. The state-owned enterprises and institutions (work units) could no longer build or directly provide houses for the employees. They needed to subsidize and encourage them to buy houses on the market. After the 1997 Asian financial crisis, the State took a strategic move and chose housing industry development as a new pillar for economic growth (Du & Zhang, 2015). Since then, the housing market experienced an unprecedented growth in China.

With the rapid development of this market which has contributed to the prosperity of the economy during the past decade. The growing unaffordability has also increased the public's concerns. As designed in the reform after the 1997 crisis, the housing has been regarded as an engine for Chinese economy. When the financial crisis of 2008-09 occurred, the government initiated loose monetary policy as well as expansionary fiscal policy to counter the negative effect and stimulate the economy. Loose lending conditions and lower interest rates brought about the skyrocketing housing price in 2010 and also the growing complaint from the society. The government has been urged to take the measures to rectify the market. For example, the government tightened the housing finance through increasing the lending rate for mortgages and raising the down-payment rates; carried out restrictions on the number of homes households can purchase; encouraged developers to provide small-scale and lower-end types of houses and increased rental housing at lower prices for low-income residents[3].

Among these measures, restriction policy was the one directly targeted at striking speculations. Though there were some differences in details from city to city, basically, this policy prohibited local residents who had a "Hukou" for that city from purchasing more than two homes and migrant households who did not have a "Hukou" from purchasing more than one home. Beijing was the first to adopt this policy in 2010 and then the policy was expanded to most of large and medium-sized cities successively.

The government also started the property-tax trial reform in Shanghai and Chongqing in February 2011. The design of the schemes for these two cities is a bit different. In Shanghai, the tax rate is 0.6 percent per year and if the property trading price is lower than twice the price of the new commercial housing in the last year, the tax rate can be reduced to 0.4 percent per year. The tax base is calculated as 70 percent of house trading price. Shanghai exempts the first home bought by a Shanghai family[4], and tax relief of 60 square meters per person is given to the second or above homes. Additionally, if the second home is bought because of children's marriage can also be temporarily exempted from paying taxes. In Chongqing, the tax rate is 0.5, 1, and 1.2 percent per year according to the property trading price. If the trading price is lower than triple and four times the price of the new commercial housing, the tax rate is 0.5 and 1 percent per year. If the trading price is higher than four times the price of the new commercial housing, the tax rate is 1.2 percent per year. The exemption only applies to one home of a

[3] Details about the policies, see (Deng et al, 2011), (Wu et al, 2012).

[4] The family has Shanghai household registration, "Hukou".

Chongqing family and depends on the area: the family can enjoy the tax exemption when the home is less than 180 square meters if the home was purchased before the new tax policy and when less than 100 square meters if the home was purchased after the tax policy implemented. If a family has a lot of houses, the family has the right to decide which one to be exempted.

Apparently, both these two municipalities target at guaranteeing the local residents' rights of residence and give some tax relief to the residents. Chongqing government gives differential treatment to the non-local residents to prohibit speculative home purchase from external capital. In Chongqing, villa and luxury houses are the focus of regulations. Shanghai treats non-residents mildly in general and target at guiding rational consumption and improving the efficiency of resource allocation. However, the tax rates in two cities are largely symbolic, levied at low levels on a few thousand homes in each city. Because of the small tax base, for example, only 8,500 large single-family homes and new luxury flats are targeted in Chongqing, the tax revenue collected in the first ten months is just 90 million Yuan, less than 0.2% of Chongqing's tax revenue.

In economics of housing, it is regarded as an investment as well as a consumption good. Housing price is known as the equilibrium price when the supply of the residential property equals the quantity demanded (McCarthy and Peach, 2004). Housing demand refers to a variety of things, from demand for housing services or individual attributes to tenure choice or households' spatial allocation (Zabel, 2004, page 17). The demand side of the housing market is driven by fundamentals such as household income, population growth, availability of credit, interest rates, and unemployment, many of which can change rapidly with the economy, especially in developing and transitional economies such as China. Because of the limitation of the total land and time in need for completing construction, the supply side of housing is more rigid. For these reasons, most of the empirical research estimating the determinants of housing price focuses on the demand side (Stepanyan et al., 2010, page 3).

However, with the rapid growth of housing prices, there are discussions that China's housing market has gone too far ahead of itself and cannot be well explained by fundamental variables, instead, macroeconomic regulation and control on prices has strong explanatory power (Wang & Yang, 2015). As described above, the government has carried out a series of macro regulatory measures, however, the housing prices still keep going up. People begin to question the effectiveness of various regulatory policy tools. The effectiveness of the regulations in the housing market can be understood from two aspects: theoretical effectiveness (how different policy tools impact the market differently); implementation (if the government is capable using these polices to achieve the desired policy objectives). So far, most literature evaluating these regulatory polices have largely focused on the first aspect and have not achieved an agreement. There are theoretical and empirical studies providing supportive evidence for government regulatory policy tools being effective in the housing market. For example, Muellbauer & Murphy (1997) and Iacoviello & Mineti (2008) find that the credit market significantly impacts housing price fluctuations. Zhang (2006) also finds that there is an inverse relationship between the housing prices and real interest rate for mortgages. Kuang (2008) finds that imposing traditional property tax in China reduces housing prices. Zhao & Luo (2013) find that introducing the new property tax has a significant effect on macro-economy and residential housing prices. However, there are literature supporting the theory of policy invalidation. For

instance, Jud & Winkler (2002), Aregger et al. (2013), Zheng & Kahn (2008) find that interest rate, tax or land polices have limited effect in housing market regulations.

Housing market regulation is a systematic project. Aside from the considerations of policy tool effectiveness, the logic of response by the general public should also be taken into account. Economist Robert Shiller has introduced psychological and behavioral factors of market participants into asset pricing models, which has motivated studies on the role of expectation in housing price fluctuations (Malpezzi & Wachter, 2005), (Kiefer, 2011). When retrospect the theoretical development of expectations, it evolves from static expectation to extrapolation expectation, adaptive expectation, and rational expectation (Xue, 2012). Xue (2012) also finds that expectation positively impacts housing prices in China and the nature of instability in expectations increases the difficulties in regulating housing market. Kuang (2010) also finds that based on rational expectation framework, the higher the expected housing prices are, the more speculative the market is and the more fluctuated the housing prices; while under the adaptive expectation framework, when the consumption demand dominates, the higher the prices of the last period is, the less fluctuated the housing prices are. When the speculation demand dominates, the higher the prices of the last period is, more fluctuations will be found.

This paper intends to provide another examination of the policy effects of the new property tax reform experimented in Shanghai and Chongqing and purchase restriction policies by controlling fundamental variables from the demand side and static expectation factors based on the previous period housing prices. The paper proceeds as follows: section one is the introduction. Section two discusses the methodology, data and the econometric model. Section three presents the main findings and results; Section four is the discussion. Section five concludes.

2. Methods

1) Hypothesis

According to Simon (1943), if government expenses are held constant, introducing the property tax can be regarded as an increase in cost to be capitalized into housing values. The housing prices will drop due to the rise in the holding costs. Based on the theoretical foundation, after introducing property tax projects in the two cities, housing prices should to some degree drop if the policy has an effect.

> Hypothesis 1: The introduction of pilot property tax projects in Shanghai and Chongqing in 2011 negatively affects the average residential housing price, ceteris paribus.

The restriction policy will strike the speculative demand if the policy has an effect, which will reduce the housing prices.

> Hypothesis 2: The introduction of home-restriction policy negatively affects the average residential housing price, ceteris paribus.

According to the mechanism of expectation formation, four types can be categorized including static, extrapolative, adaptive and rational expectations. In this paper, static expectation is

adopted. The core of static expectation formation is that the expected price at the current period is determined by the prices of previous period and it does not consider the dynamic changes and just simply regards the price of last period as the expectation for current market prices.

> Hypothesis 3: The housing prices of the previous period positively affects the average residential housing price, ceteris paribus.

2) Model specification

The main interest of this paper is to examine the effectiveness of macro-regulatory policies carried out by the government including the new property tax reform and purchase restriction policies and the impact from expectation. The reduced-form of baseline linear model is as follow:

$$\ln(HP_{i,t}) = c0 + c1*L1.\ln(HP_{i,t}) + c2*DUM2011SH + c3*DUM2011CQ + c4*homeres + eit. \quad (1)$$

Based on the analysis above, housing price is also determined by social-economic fundamental variables, so I control for these factors from the demand side and introduce city and time fixed effect into the model in order to capture the unobserved city and time invariant factors as follows:

$$\ln(HP_{i,t}) = c0 + c1*L1.\ln(HP_{i,t}) + c2*DUM2011SH + c3*DUM2011CQ + c4*homeres + c5*X + \mu i + \lambda t + eit. \quad (2)$$

The unit of analysis of this study is city. $Ln(HP_{i,t})$ denotes the natural log of housing prices; $L1.ln(HP_{i,t})$ denotes the first lag of log prices; DUM2011SH and DUM2011CQ are policy dummy variables for property tax trial reform, DUM2011SH equals one for Shanghai after Jan 2011 and zero otherwise; DUM2011CQ equals one for Chongqing after Jan 2011 and zero otherwise; homeres is a policy dummy variable for home purchase restriction policy, equals one for each city when the policy was introduced; zero otherwise; X captures a matrix of covariates from the demand side fundamentals listed below; μi is the city fixed effect; λt is the time fixed effect; eit is the error term; ci's are the coefficients to be estimated.

By adopting a panel dataset covering 14 Chinese cities from 1995 to 2002, Shen & Liu (2004) finds that the determinants of housing prices include vacancy, construction cost, consumer price index, population, unemployment rate, and household income. Based on the data feasibility, we control for these variables in the model. Aside from the traditional social-economic factors, I also generate two year-dummy variables Year2008 and Year2009 to further examine the impact of brought by the 2008 financial crisis and the economic stimulus plan carried out by the government starting from 2009. Since most of the regulatory measures were carried out in 2010. Another year-dummy variable Year2010 is generated to capture the general impact on the housing prices during this year. In this study, a proxy variable to measure local governments' fiscal autonomy is also generated by calculating the ratio of local governments' revenue to GDP

(Zhang & Gong, 2005), (Enikolopov & Zhuravskaya, 2007) to capture the local governments' financial strength and their autonomous deciding power on development strategies.

Table 1: Variable description

Symbols	Variables (description)	Classification	Unit
lhp	Log form of commercial residential property prices	Dependent variable	Yuan
L1.lhp	the first lag of commercial residential property prices	Key variables of interest	Yuan
DUM2011SH	0/1 Dummy Variable. DUM2011SH = 1 when after Jan 2011 and id=10 (Shanghai); DUM2011SH = 0 otherwise		[0,1]
DUM2011CQ	0/1 Dummy Variable. DUM2011CQ = 1 when after Jan 2011 and id=27 (Chongqing); DUM2011CQ = 0 otherwise		[0,1]
homeres	0/1 Dummy Variable. Homers=1 when restriction policy implemented, homers = 0 otherwise		[0,1]
disIncpc	Disposable income per capita for urban households	Control variables	Yuan
cpi	Consumer Price Index		%
lregdppc	Log form of regional GDP per capita		Yuan
pti	Tertiary industry's percentage in GDP		%
lpop	Log form of total population		
unempr	Unemployment rate		%
redr	Total Investment in Fixed Assets for Real Estate Development in Urban Area(100 million Yuan)/ Investment in Fixed Assets(10000 Yuan)		%
fisauto	local government revenue/ regional GDP		% (proxy for fiscal autonomy)

Year2008	0/1 Year Dummy Variable. (financial crisis)	[0,1]
Year2009	0/1 Year Dummy Variable. (economic stimulus package carried out)	[0,1]
Year2010	0/1 Year Dummy Variable. (regulatory policies carried out)	[0,1]
city fixed effect (μi)	Dummy variable to control for unobserved variation of cities in China	
time fixed effect (λt)	Dummy variable to control for unobserved time-invariant specific effect	
eit	Error term	

Table 2: Propositions for control variables

GDP per capita	Cities with higher GDP per capita have the tendency to be associated with higher housing prices
Total Investment in Fixed Assets for Real Estate Development in Urban Area/ Investment in Fixed Assets	Cities with higher rate of investment in fixed assets for real estate development in urban area as a percentage of all investment in fixed asset have the tendency to be associated with higher housing prices
Disposable income per capita for urban households	Cities with higher level of disposable income per capita for their urban households have the tendency to be associated with higher housing prices
Tertiary industry's percentage in GDP	Cities with higher tertiary industry's percentage in GDP have the tendency to be associated with higher housing prices
Consumer Price Index	Cities with higher CPI have the tendency to be associated with higher housing prices
Population	Cities with larger population have the tendency to be associated with higher housing prices
Unemployment rate	Cities with lower unemployment rate have the tendency to be associated with higher housing price
Fiscal autonomy	Cities with higher fiscal autonomy have the tendency to be associated with higher housing prices
Year2008	Expected sign to be negative due to the shock to the economy brought by the financial crisis

Year2009	Expected sign to be positive due to the effect from the economic stimulus package and loose monetary environment (a large amount of credit go into the real estate market)
Year2010	Expected sign to be negative due to the effect from the regulations targeting at controlling housing prices

3) Data

As a real Chinese property market had not been established until 1998. The market itself is quite young thus the data is limited. From 1998 to 2009, data from the China Statistical Yearbooks includes newly-built commercial house price indices of 35 large Chinese cities on an annual basis. Since 2009, the data provided by China's National Bureau of Statistics has been expanded to include 70 large and medium-sized Chinese cities. However, data for 2010 was not provided. The price index is measured based on the previous level, meaning only growth rates are captured but not the price levels per se. There is another sale price indexes of residential property of 70 cities reported by China's National Bureau of Statistics, however, data for 2011 was not available. So these data sources are not workable for this study due to the missing data during the policy periods. Considering the data feasibility, in this study, another data source from National Development and Reform Commission of China is used which reports per square meter prices of commercial residential properties across 35 large and medium sized cities on a monthly basis, downloaded from CEIC database. Monthly data for CPI comes from CEIC database as well and so is quarterly data for disposable income per capita.

The rest of data used in this study are collected and obtained from the China City Statistical Yearbooks on an annual basis published by the National Bureau of Statistics of China[5]. The data include annual data on regional GDP per capita for all 35 cities, tertiary industry's percentage of GDP, total population, local government revenue, investment in fixed assets, total investment in fixed assets for real estate development. Descriptive statistics are provided in Table 3.

Monthly data for the average residential property price for all 35 large and medium-sized cities is only available since 2007 through 2012. In total, there are 2100 observations in the sample across all 35 cities.

Table 3: Descriptive Statistics

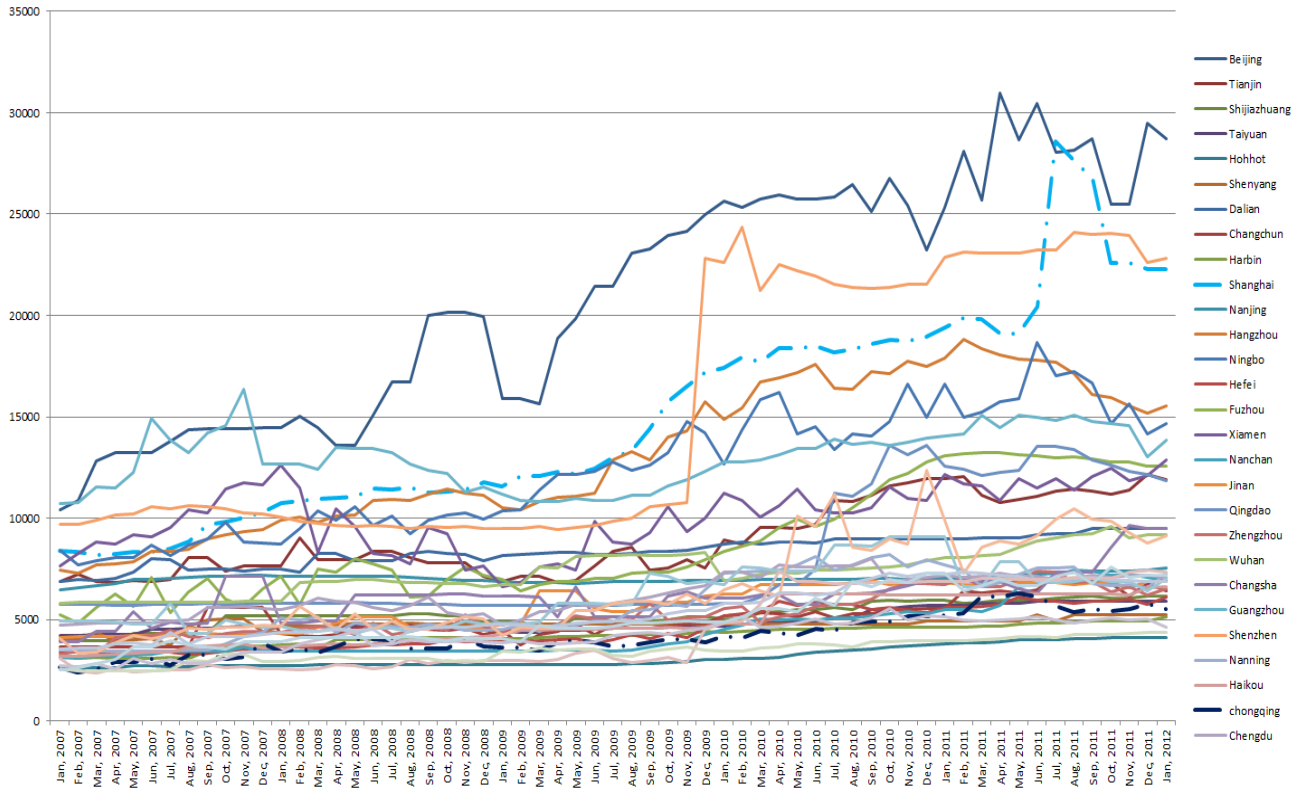
[5] Available in the China Statistical Yearbook Database http://tongji.oversea.cnki.net.libproxy1.nus.edu.sg/chn/navi/HomePage.aspx?id=N2015040001&name=YZGCA&floor=1

Variable	Symbols	Observations	Mean	Std. Dev.	Min	Max
Prices of commercial residential properties	hp	2100	7325.85	4546.19	2366	30944
Dummy variable for property tax reform trial in Shanghai	DUM2011SH	2100	0.005	0.072	0	1
Dummy variable for property tax reform trial in Chongqing	DUM2011CQ	2100	0.005	0.072	0	1
Dummy variable for home purchase restriction policy	homeres	2100	0.204	0.403	0	1
Disposable Income per capita	disIncpc	2100	12740.33	6897.08	2653.96	36505.04
Consumer price index	cpi	2100	103.67	2.95	95.3	113.6
Regional GDP per capita	regdppc	2100	43233.88	19569.23	12457	106880
Percentage of tertiary industry	pti	2100	48.7168	7.59	34.93	75.53
Total population	pop	2100	693.02	536.84	144.68	3303.45
Unemployment rate	unempr	2100	1.69	0.59	0.27	4.62
Total Investment in Fixed Assets	inv	2100	1.84e+07	1.35e+07	1410423	6.93e+07
Total Investment in Fixed Assets for Real Estate Development in Urban Area	red	2100	4883976	4556933	293810	2.90e+07
Fiscal Autonomy	fisauto	2100	0.087	0.029	0.038	0.175
Dummy Variable for the Year 2008	Year2008	2100	0.2	0.4	0	1
Dummy Variable for the Year 2009	Year2009	2100	0.2	0.4	0	1
Dummy Variable for the Year 2010	Year2010	2100	0.2	0.4	0	1

To have a graphical overview of policies' impact on the changes of housing prices, based on the data for commercial residential property prices I have collected, a descriptive graph is drawn as below (Figure 5). Shanghai and Chongqing, two cities with property tax reform are drawn in

dashed lines. From the graph, we can detect considerate fluctuations in the housing prices for Shenzhen at the end of 2009 and for Shanghai during the later half of 2011, which impairs the even distribution of the housing prices to some degree. However, news articles[6] have provided explanations for these two unusual fluctuations due to professional speculations. So we remain these data and do not remove the outliers. However, this may influence the final results in the regression model, we will discuss more in the limitation section.

Figure 5: The Development of Housing Prices of All 35 Cities (Jan 2007—Jan 2012)



3. Results

1) Main findings

Pooled OLS and fixed effect panel regressions are used to estimate parameters for equation (2) above. The estimated results of Model (I) and Model (II) are presented in table 4.

Table 4 Panel Regression Results for All 35 Cities

[6] see for sources: http://news.163.com/10/0121/13/5TIB99TD0001124J.html and http://news.sina.com.cn/c/nd/2016-03-31/doc-ifxqxcnp8239536.shtml (in Chinses)

Outcome Variable: Ln HP_t				
Independent Variable	(I) Pooled OLS		(II) Fixed Effect	
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.
$LnHP_{t-1}$	0.976***	(0.007)	0.874***	(0.023)
Property Tax SH	0.009**	(0.004)	0.041***	(0.011)
Property Tax CQ	-0.017***	(0.006)	0.014	(0.011)
Home Restriction	-0.012***	(0.003)	-0.011	(0.010)
Disposable income per capita	1.72e-07	(2.75e-07)	-8.78e-07	(1.13e-06)
CPI	0.001	(0.001)	-0.003*	(0.001)
Ln (regional GDP per capita)	0.012**	(0.005)	-0.042	(0.027)
Tertiary industry's percentage in GDP	0.0002	(0.0002)	0.001	(0.001)
Ln (total population)	0.004**	(0.002)	0.017	(0.051)
Unemployment rate	-0.001	(0.002)	-0.007*	(0.004)
The percentage of total Investment in Fixed Assets for Real Estate Development	0.011	(0.029)	-0.186***	(0.066)
Fiscal autonomy	0.170***	(0.054)	0.121	(0.128)
Year 2008	-0.014***	(0.003)	-0.104***	(0.026)
Year 2009	0.006	(0.005)	-0.102***	(0.029)
Year 2010	0.006	(0.005)	-0.048**	(0.022)
City Fixed Effect	No		Yes	
Time Fixed Effect	No		Yes	
Observations	1925		1925	
R-squared: Within	0.932		0.937	

Note: This table shows the panel data regression results for Pooled OLS model (I) and Fixed Effect model (II). Two regressions estimate the results based on the equation (2). Housing prices, total population and regional GDP per capita are in natural log forms. Robust standard error in parentheses, *** statistically significant at 1% level, ** at 5% level, * at 10% level.

We can summarize the results of Model (I) as follows: The regression has a satisfactory goodness of fit which is indicated by the large R-squared. For the variables of the main interest, model (I) gives us all significant results, housing prices of the pervious period have contributed

to the increase of the housing prices at the current period by 97.6%, which indicates that expectation has a significant role in pushing housing prices high. The sign of the coefficient of property tax reform in Shanghai is positive and the magnitude is 0.009 meaning the introduction of the new property tax counterintuitively and statistically significant in pushing housing prices high by 0.9%. The theoretical expected policy effect in controlling housing prices is not achieved. The sign of the coefficient of property tax reform in Chongqing, however, is negative, which is consistent with the hypothesis. It shows that the introduction of property tax in Chongqing has statistically significantly reduced housing prices by 1.7% at 1% significance level. The sign of the coefficient of home purchase restriction policy is also negative, also consistent with the hypothesis. This policy has statistically significantly reduced housing prices by 1.2% at 1% significance level. The signs of other covariates are largely consistent with our expectation as well. It may reflect that real housing prices are positively related to the demand-side factors, including GDP per capita, tertiary industry's percentage of GDP, the proportion of fixed-asset investments spent on real estate development, population, fiscal autonomy, etc. However, among these controls, only population and GDP per capita and fiscal autonomy have significant results. For year dummy variables, except for Year 2010, the rest of two have the expected directions of the impact, yet only Year 2008 significantly dragged the prices down by 1.4%. With a series of harsh regulatory policies carried out during the year 2010, however, the sign of the coefficient is till positive. In general, for the pooled OLS model, we find home purchase restriction policy and the new property tax introduced in Chongqing are effective in controlling housing prices. However, the property tax trial in Shanghai is not effective in terms of curbing the prices from going up. The findings in this study generally confirm the results found by Du and Zhang (2015). The design in the scheme of the property tax reform for Chongqing may be better than that for Shanghai. Expectation plays a large and significant role in driving housing prices high which proves the hypothesis 3.

When conducting a fixed effect analysis, the R-squared increases slightly still indicating a goodness of fit of the model. However, the results for property tax in Chongqing and restriction policy in model (II) become insignificant. And the sign of the coefficient of property tax reform in Chongqing becomes positive as well. The sign of the coefficient of property tax reform in Shanghai is still positive, but the magnitude greatly increases to 0.041 meaning the introduction of the new property tax has a statistically significant effect in pushing housing prices high by 4.1% on average at 1% significance level, other things held constant. Housing prices of the last period have contributed to the increase of the housing prices at the current period by 87.4%, still at 1% significance level, which indicates that expectation has a significant and valid role in pushing housing prices high. For many covariates, the results are not very robust and are sensitive indicated by the change in the directions of the coefficient, such as disposable income per capita, cpi, GDP per capita in logs, the percentage of total investment in fixed assets for real estate development and these changes are against the initial expectation. For year dummies, they all become significantly and negatively affecting the housing prices. Year 2009 has reduced housing prices by 10.2% on average at 1% significance level, which is counterintuitive. In general, for the fixed effect model, we find that the effects in controlling housing prices for home purchase restriction policy and the new property tax introduced in Chongqing are not significant. However, the significant but counterintuitive results indicate that property tax trial in Shanghai fails to curb the soaring housing prices. The results for expectation are rather robust, and it plays a significant role in driving housing prices high in line with the hypothesis 3.

2) Robustness tests

China's National Bureau of Statistics has provided a way to categorize Chinese cities by city size[7]. According to this city statistics, there are 12 super large-sized cities with a population above 2,000,000 persons in total. Among them, 11 cities are in the dataset. A descriptive graph focusing on these 11 super large cities is drawn as below (Figure 6). In this graph, the orange dashed line captures the situation of Shanghai and the red dashed line captures Chongqing, we fail to detect a significant drop in the housing prices in Feb 2011, after the property tax projects implemented in these two cities. We use the dataset for only these 11 super large-sized cities to do a robustness test for the models above to see if the results hold in general when the social-economic differences across cities become smaller. Like the main findings, pooled OLS and fixed effect panel regressions are used to estimate parameters for equation (2) above. The estimated results of Model (I) and Model (II) are presented in Table 5.

Figure 6: The Development of Housing Prices of 11 super large Cities (Jan 2007—Jan 2012)

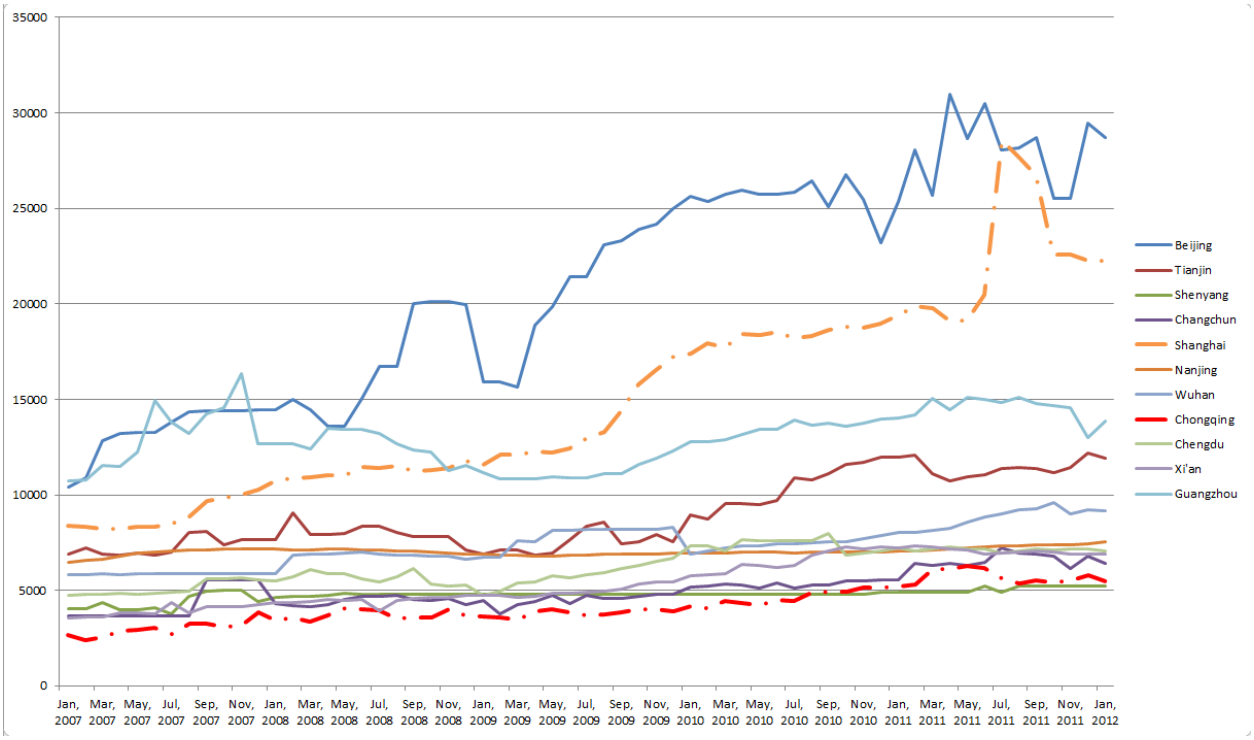


Table 5 Panel Regression Results for 11 Super Large-sized Cities

[7] http://chinadataonline.org/member/city/city_md.asp

Outcome Variable: Ln HP_t				
Independent Variable	(I) Pooled OLS		(II) Fixed Effect	
	Coefficient	Robust Std. Err.	Coefficient	Robust Std. Err.
$LnHP_{t-1}$	0.956***	(0.013)	0.866***	(0.026)
Property Tax SH	0.025***	(0.008)	0.071***	(0.021)
Property Tax CQ	-0.008	(0.007)	0.005	(0.019)
Home Restriction	-0.015***	(0.003)	-0.015	(0.009)
Disposable income per capita	-5.12e-07*	（2.70e-07）	2.08e-09	(1.54e-06)
CPI	0.002**	(0.001)	0.002	(0.003)
Ln (regional GDP per capita)	0.026***	(0.010)	0.059	(0.045)
Tertiary industry's percentage in GDP	0.002***	(0.001)	0.003	(0.002)
Ln (total population)	0.017**	(0.007)	0.100	(0.408)
Unemployment rate	-0.0001	(0.004)	-0.008	(0.005)
The percentage of total Investment in Fixed Assets for Real Estate Development	-0.092	(0.064)	-0.168	(0.128)
Fiscal autonomy	0.117	(0.082)	0.741	(0.571)
Year 2008	-0.014***	(0.004)	0.006	(0.030)
Year 2009	0.010	(0.007)	0.002	(0.055)
Year 2010	-0.006	(0.004)	0.028	(0.022)
City Fixed Effect	No		Yes	
Time Fixed Effect	No		Yes	
Observations	605		605	
R-squared: Within	0.935		0.942	

Note: This table shows the panel data regression results for Pooled OLS model (I) and Fixed Effect model (II). Two regressions estimate the results based on the equation (2). Housing prices, total population and regional GDP per capita are in natural log forms. Robust standard error in parentheses, *** statistically significant at 1% level, ** at 5% level, * at 10% level.

Except for the signs of coefficients of a few variables change, in general, the results given by two models are consistent with the main findings, especially for the variables of interest. The magnitude of the coefficients is increased largely. For pooled OLS model (I), housing prices of

the pervious period have contributed to the increase of the housing prices at the current period by 95.6% on average and the expectation still has a significant role in pushing housing prices high. The sign of the coefficient of property tax reform in Shanghai is positive and the magnitude is 0.025 meaning the introduction of the new property tax has a statistically significant effect in pushing housing prices high by 2.5% on average, at the significance level of 1%. This is still counterintuitive. The sign of the coefficient of property tax reform in Chongqing, however, is negative, which is consistent with the hypothesis, but the result turns out to be not significant, different from the main findings. The sign of the coefficient of home purchase restriction policy is also negative, consistent with the hypothesis and consistent with the results from the main table. This policy has statistically significantly reduced housing prices by 1.5%, a bit larger than 1.2% in the main findings at the significance level of 1%.

In fixed effect model (II), the results for property tax in Chongqing and restriction policy are still insignificant, and the signs of the coefficients have not changed compared with the results from the main table. The sign of the coefficient of property tax reform in Shanghai is still positive, but the magnitude changes from 0.041 to 0.071, meaning the introduction of the new property tax has a statistically significant effect in pushing housing prices high by 7.1% on average at 1% significance level, other things held constant. Housing prices of the last period have contributed to the increase of the housing prices at the current period by 86.6%, still at 1% significance level, which indicates that expectation still has a significant effect in pushing housing prices high.

4. Discussions

1) Possible explanations for counterintuitive results

Based on the regression results we have, I find that the property tax trial project in Shanghai can be viewed as a failed policy as it does not effectively reduce the housing prices, instead drives the prices up no matter from pooled OLS model or fixed effect model. And this argument passes the robustness test. For the project implemented in Chongqing, however, the results from the fixed effect model are generally insignificant, but pooled OLS model gives significant results which are in line with the hypothesis, indicating its effectiveness in help control housing prices, other conditions held constant. However, it does not pass the robustness test, showing that the results are not stable enough. For home-purchase restriction policy, pooled OLS model provides results showing that this is an effective policy in curbing the housing prices, but fixed effect model does not provide significant results, but the sign of the coefficient remains negative and it passes the robustness test. The results for expectation are highly robust and they are consistent from Model (I) and (II) and also pass the robustness test. The findings in this study generally confirm the findings from other studies on property tax reform and macro-regulation measures, see for example Du and Zhang (2015), who find that the trial property tax of Chongqing effectively reduces the growth rate of Newly-Built House Price Indexes and find no significant effect for the trial property tax of Shanghai and also find that purchase restrictions in Beijing specifically are effective in controlling the fast growth of housing prices.

There are several possible explanations for the counterintuitive results for the property tax trial in Shanghai. First, the new property tax scheme introduced in Shanghai from 2011 was rather mild and modest, even compared to the design of the Chongqing case. The reform in these two cities

remained limited in terms of the narrow tax base as well as the low tax rate due to the political resistance from the public as well as the administrative cost as barriers for the implementation. Such limited tax, for a short time span (the dataset can only capture one year after the trial was carried out), raises econometric challenges. Second, from the theoretical perspective, the rationale for property tax is not controlling housing prices discussed in textbooks, instead, its main purpose is to have reliable revenue source for the local government. How much can this source replace land revenue currently obtained and pursued by the local governments in China remains uncertain. Possible inactive responses from the local governments, which indicate potential conflicts in policy objectives, may constrain the effects of the property tax to take place. Third, following the second point, policy objectives at the central government level are also mixed and the uncertainty about the priority is an issue. Regulatory measures cannot take effect properly without a specific and unitary objective set by the State. As mentioned in the institutional background, after the 1998 housing market reform, it was treated as a growth engine in China. Chinese economy since then has relied on investment in these non-tradable sectors. Real estate market prosperity has been favored by government's support. With the strong belief that the government will not let the market to fall, housing prices are in the current easy monetary policy environment, determined more as an asset to hold than need, which can be suggested by massive unsold homes, so the proper tax may have an extremely limited role in this context. Fourth, as defined in the economics of housing, it is a consumption good as well as an investment good, housing prices may not only be determined by consumption demand but also investment demand. As one of the limited investment channels in China, if the expectations in housing market for prices to go up can not be changed, the speculative demand will always be there. So the cost brought by the new property tax can always be internalized into the price at the transaction stage, which counterintuitively contributes the rise in the prices.

2) Limitations

However, there are several limitations requiring deliberations in the current study. First, this study measures market expectation using the static theory, however, the actual situation can be far more complex and static expectation may not be sufficient in explanation in this case. As suggested by Wang and Yang (2015), the expectation pattern in Chinese housing market may lie in between adaptive expectation and rational expectation. Hence, to further develop the study, more sophisticated examinations of expectation is needed. Second, after 2009, various policies carried out at different stages target at regulating the housing market. With all these confounding polies going on, policy dummy variables may have a limited capability to differentiate the policy effects from different polices and are not able to provide precise estimations. For instance, the failure to take into account another policy of indemnificatory housing after 2009 which also varies across cities, due to the data availability, may lower the precision of our estimations. Moreover, in this study, supply side factors are left out of considerations, which impose challenges on obtaining prudent results. In addition, some sharp fluctuations in the housing prices are detected from the data. These outliers can have extreme impact on the estimated results and lower the efficiency of our estimations. From figure 6, for the case of Shanghai, two or three months after the initial implementation, a mild drop is observed and a more modest drop for Chongqing is found as well. Hence, we can hypothetically believe there is a lagged policy effect for these two property tax trials. However, the mechanism for the lag to take effect remains to be further investigated, which also relies on a proper data provided by the government

on property tax revenue and on a larger dataset to cover a longer time span as so to have a more reliable estimation.

5. Conclusion

In this study, using pooled OLS and fixed effect panel regression analysis based on 35 large and medium-sized Chinese cities by adopting monthly data from 2007 to 2011, I examine the effects of home purchase restriction policy and the trials of property tax reform in Shanghai and Chongqing and the expectation. I find that home-purchase restriction policy significantly reduces the housing prices by 1.2 per cent via adopting pooled OLS regression model and the property tax trial in Chongqing reduces the housing prices by 1.7 per cent, while the property tax trial in Shanghai instead has a significantly positive effect on the housing prices, results robust to pooled OLS model and fixed effect model, which suggests a policy failure in this experiment. Expectation significantly contributes to the large increase of the housing prices, more than 80 per cent rise in the housing prices can be explained by the expectation. The findings suggest that in order to control the skyrocketing housing prices, 1) the focus should be put on altering market participants' expectations about the development of housing prices; 2) home-purchase restriction policy can be adopted as a regulatory measure to strike speculative operations in the short run; 3) the effectiveness of the new property tax introduced has not been clear yet. The scheme of property tax trial in Chongqing with a larger proportion of taxable houses proves to be more effective than the trial in Shanghai. Hence, the tax base is important and much more details must be paid to the design of this tax and further detailed research is required.

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