



Home-purchase restriction, property tax and housing price in China: A counterfactual analysis



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ABSTRACT

In this paper, we respectively evaluate the effects of home-purchase restrictions and the trial property taxes on housing prices in China using a counterfactual analysis. We modify the method of Hsiao, Ching and Wan (2012) by using the leave- n_{it} -out cross-validation criterion for the optimal choice of the control cities. Some Monte Carlo simulations illustrate the better performance of our method. We then construct the counterfactual growth rates of housing prices in Beijing, Shanghai and Chongqing using the selected control cities. We find that: (i) purchase restrictions reduced the annual growth rate of housing prices in Beijing by 7.69 percent; (ii) the trial property tax of Chongqing reduced the annual growth rate of housing prices by 2.52 percent; (iii) the trial property tax of Shanghai had no significant effect on housing prices.

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1. Introduction

To curb the soaring housing prices, the Chinese government has adopted a series of policies in recent years, among which, home-purchase restriction and property tax are two of the most important and influential ones. Home-purchase restriction was first started in Beijing in May 2010 and then progressively implemented in most major cities in China. It prohibits resident households from buying more than two homes and non-resident households from buying more than one home. The pilot programs of property tax were implemented in Shanghai and Chongqing in January 2011. The property tax in Shanghai targets the second and above homes purchased after January 28, 2011, while the property tax in Chongqing is mainly levied on high-end homes.

The purchase restriction and the property tax policies have aroused nationwide heated debates on: (i) whether purchase restrictions should be replaced by property taxes; (ii) which trial tax scheme is more effective in curbing housing prices, Shanghai scheme or Chongqing scheme.

Answering these questions involves estimating the effects of these policies separately, which, however, faces several difficulties. First, conventional policy evaluation methods like difference-in-difference require detailed micro-level data, which are hard to

obtain in general. Second, it is not an easy task to model how and why housing prices in a city have changed over time, as well as what factors have affected the changes. Third, there are many confounding policies going on, for example, the differentiated credit policy and the policy of indemnificatory housing etc.

Similar to Hsiao et al. (2012, hereafter HCW), we overcome the above issues by exploiting the dependence of housing prices among different cities and constructing the counterfactuals using data from cities without purchase restrictions and property tax. As housing prices of different cities are often driven by some common factors, information on other cities can help to predict housing prices in a particular city. Our real data analysis below (cf. Figs. 3, 5, and 7) confirms this point. Therefore, using housing prices of cities not subject to purchase restrictions or property tax, we estimate what would have happened to the growth rates of housing prices in Beijing, Shanghai and Chongqing if there had been no purchase restrictions or property tax. We then estimate the effects of purchase restrictions and property tax by the difference between the actual housing prices and the counterfactuals.

A subtle problem is the optimal choice of the control cities to construct the counterfactuals. As most major cities in China are subject to purchase restrictions, our candidate control cities for Beijing are mainly medium-sized ones. Since Chongqing is not subject to purchase restrictions,¹ we again use the medium-sized

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¹ There is a common misunderstanding that takes property tax in Chongqing for home-purchase restriction. We verified both from the municipal government of Chongqing and other sources, Chongqing has so far only adopted property tax.

cities to construct the counterfactuals for Chongqing's property tax so that the effects of the property tax are not contaminated by purchase restrictions. As Shanghai is subject to both policies, to separate the effect of property tax from that of the purchase restrictions we use cities with purchase restrictions implemented about the same time as Shanghai for the control group. A common problem for choosing the control cities is: on the one hand, we would like to select some cities that can fit the housing prices of Beijing, Chongqing and Shanghai well; on the other hand, too many control cities will also lower the model predictive ability. Our derivation below (cf. (11)) confirms these two points.

We propose to use the leave- n_v -out cross-validation ($CV(n_v)$) of Shao (1993) for the optimal choice of the control cities. We show that the $CV(n_v)$ objective function mimics the mean squared prediction error, and hence it is consistent in the sense that the probability of selecting the optimal model converges to 1 as $T \rightarrow \infty$. Moreover, the probability of selecting the model with the best predictive ability also converges to 1. Some Monte Carlo simulations show that in terms of mean squared prediction error $CV(n_v)$ performs better than AICC and AIC methods used by HCW, which supports our theoretical findings.

Our results show that from May 2010 to November 2011 the average annual growth rate of housing prices in Beijing would have been 16.97% if there had been no purchase restriction, while the actual annual growth rate during this period is 9.28%. Therefore home-purchase restrictions reduced the annual growth rate of housing prices in Beijing by 7.69 percent. We find that the trial property tax in Chongqing reduced the annual growth rate of housing prices by 2.52 percent from February 2011 to November 2012, while the trial property tax in Shanghai had no significant effect on the housing prices.

As a robustness check, we examine the micro-level data by China Household Finance Survey (CHFS) and find that 31% of households living in Beijing are restricted from home purchasing, while only 0.6 percent of households living in Shanghai are likely to be subject to the trial property tax. Based on the data released by Chongqing Municipal Finance Bureau, 10% of households living in Chongqing are subject to the trial property tax in 2011.

Therefore, based on our analysis, our answers to the heated debates are: (i) home-purchase restrictions are more effective than property taxes, and it cannot be replaced by the property tax at least in the short-run, if the government is still willing to curb the housing prices; (ii) the property tax scheme of Chongqing is more effective than the one of Shanghai.

Finally, we relate our studies to some existing literature. Studying the effects of home-purchase restrictions on housing prices has not been established in the existing literature because home-purchase restrictions in such scale are not very common.² It is indirectly related to the literature of rationing. Howard (1977) provides a theoretical model to study how rationing affects consumption. Mackay and Whitney (1980) decompose the total effect of quantity constraint into substitution effect and income effect. Empirical studies on credit rationing include Berger and Udell (1992) and Steijvers and Voordeckers (2009) etc. It is important to note that credit rationing comes from the supply of credit, while home-purchase restrictions are imposed on the demand side.

There are many studies on the impact of property tax on housing prices. On the one hand, imposing property tax, holding public expenditures constant, might be capitalized into house values. The prices of houses fall by the present value because of the projected increase of holding costs, see e.g. Simon (1943),

Netzer (1966), van den Noord (2005) and Cebula (2009). On the other hand, increases in public expenditures, holding property tax constant, might have offsetting effects on housing prices because of the improved local public services quality, see e.g. Oates (1969), Hamilton (1976), Rosen and Fullerton (1977), Fische (1992) and Lang and Jian (2004). It is important to note that the trial property taxes in Chongqing and Shanghai are less likely to affect the quality of local public services because they have not been an important source of local tax revenue³ and the property tax revenue has been mainly used to finance the supply of cheap rental housing for low-income urban households. Recently, Bai et al. (2014) establish the consistency result of the HCW method for nonstationary data, and hence make the method a valuable tool for studying macroeconomic policies. They then apply the method to property tax policies without considering the home-purchase restrictions.

The rest of the paper is organized as follows. Section 2 introduces the institutional background of Chinese housing market and a simple theoretical model to study the effects of home-purchase restrictions and property tax on housing prices. Section 3 presents the econometric method and some Monte Carlo simulation results. Section 4 presents the empirical analysis. In Section 5 we conclude. The proofs are given in the Appendix.

2. Institutional background and a theoretical model

This section first introduces the institutional background of Chinese housing market. Then, we build a simple theoretical model to analyze the effects of purchase restrictions and property tax on housing prices, respectively.

2.1. Institutional background

Chinese housing market experienced four stages of development: nonexistence, early development, expansion, and policy interventions to control the soaring housing prices.

Between the founding of the People's Republic of China in 1949 and 1988, Chinese housing market was non-existent. In the urban areas, housing, as part of social welfare, was provided by government institutions or state-owned enterprises (*work units*). In the rural areas, households live in houses that were either built by themselves on the land assigned or provided directly by the village. During this period, there was no market for households to buy or sell a home.

A constitutional amendment in 1988 provided a legal foundation for private housing development. The government still retains the ownership of urban lands. However, home buyers acquire the right of land use for 70 years. Though residents were encouraged to purchase their residential homes from their *work units* at discounted prices, housing was still allocated as a welfare good rather than a commodity traded on the market. As a result, the secondary market for housing was not very liquid in the first decade after the reform.

The issue of the 23rd Decree by the State Council in 1998 marked the beginning of the modern Chinese housing market. *Work units* were not allowed to build or buy residential units for their employees. Instead, *work units* had to integrate housing benefits into their employees' salary to help them buy homes on the market. As a strategic move following the 1997 Asian financial crisis, the reform was designed to promote the commercial

² A few countries such as Australia, Brazil, and Argentina recently imposed home-purchase restrictions on foreign individuals and companies, but the scale is much smaller than the one in China.

³ Based on data released by Chongqing Municipal Finance Bureau, the total trial property tax revenue in 2011 is 100 million RMB, which is only 0.12 percent of the local tax revenue. Based on China Real Estate Index System (CREIS) data, the estimated trial property tax revenue in Shanghai is about 300 million RMB in 2011, which is only 0.1 percent of the local tax revenue.

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