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Property taxes and home prices: A tale of two cities

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ABSTRACT

We explore the influence of property taxes on home prices, taking advantage of a policy experiment of property taxation in Shanghai and in Chongqing starting from January 2011. Using the approach suggested by Hsiao, Ching and Wan (2012) we estimate hypothetical home prices in the absence of property taxation for Shanghai and Chongqing using home prices in other cities and provinces. We show that the OLS generates consistent estimators when the price series are non-stationary I(1) processes. We apply the model to a panel of average home prices of 31 cities and provinces in China, and find the property-tax experiment lowered the Shanghai average home price by 11%–15% but raised the Chongqing average home prices by 10%–12%. An examination of the policy details and data on prices by home types suggests the post-treatment price increase in Chongqing can be driven by a spillover effect from high-end to low-end properties.

1. Introduction

How do property taxes influence home prices? The literature on local public finance says the effect should be strictly negative, as long as property taxes are, at least partially, capitalized.[1] Intuitively, property taxation imposes additional user costs on a property and thus reduces its value. Under full capitalization, differences in home prices exactly equal the present discounted value of variations in expected property tax liabilities. To see this, suppose a property has a finite life span of n years. Let P_t be its market value in year t ($1 \leq t \leq n$). Y_s is the inflow of property value in year s. i is the interest rate and τ the property tax rate. Under standard assumptions,

$$P_t = \sum_{s=t}^{n} \frac{(Y_s - \tau P_s)}{(1+i)^{s-t}}. \quad (1)$$

Apparently, P_t declines in τ.

However, testing the influence of property taxes on home prices involves several difficulties. Firstly, the causality can run from P to τ. If the local government targets a fixed amount of tax revenue, then lower tax rates can be imposed on communities with higher home values. Secondly, Y_t, i, and other factors are hard to control for. For example, Y_t is associated with the quality of local public services, monetary policies, inflation, and public expectations (Poterba, 1984). All these factors are hard to fully identify. The literature has pointed out that, when property taxes are used to finance local public services like in the US, higher tax rate is associated with higher P by improving the quality of public goods (Rosen and Fullerton, 1977). To avoid biases arising from these endogeneity problems, some authors use natural experiments derived from exogenous policy changes (for example, Rosen, 1982). Nonetheless, even if changes in τ are exogenous, it remains challenging to fully control for Y_t, for i, and for other factors.

This paper estimates the influence of property taxes on home prices, taking advantage of a property-tax experiment implemented in China at the end of January 2011, in two cities only—Shanghai and Chongqing. Unlike many other countries, there has been no property taxes in China until then. Thus, in addition to having an exogenous change in τ, our study offers several advantages. Firstly, since property taxes have not been a major source of Chinese governments' tax revenue and are not used

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[1] This was first formally developed and tested by Oates (1969). Many authors followed including Rosen and Fullerton (1977), Rosen (1982), Palmon and Smith (1998), and Feldman (2010).

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to finance local public goods, it avoids a standard bias in this literature that higher property taxes are associated with better public goods.[2] Secondly and most importantly, we can use home prices in other cities/provinces to control for potential changes in Y_t, in i, and in other factors for Shanghai and Chongqing, instead of identifying variations in each factor. In particular, we estimate hypothetical home prices in the absence of property taxes in the treatment group using home prices in the control group, compare hypothetical prices with actual prices, to identify the treatment effect of the property-tax experiment.

This approach, motivated by Hsiao et al. (hereafter HCW) (2012), is different from the conventional difference-in-difference (DID) approach. Firstly, the DID assumes there is no sample selection effect, but HCW's method does not require this assumption. Secondly, HCW allows for more flexibilities in the estimation. To see this, suppose Y_t changes before and after the policy experiment. The DID approach assumes the treatment and control groups share exactly the same change in Y_t as well as bear the same influence, so that taking differences has it removed. These can hardly apply to local home-price variations in China. Suppose that, an expansionary fiscal policy drives up home prices in all cities like the 2008 China Fiscal Stimulus Plan. It is possible that home prices rise by more in Shanghai than in Jiangsu or vice versa because, in China, local governments' economic powers vary so that their responses to macro policies also vary. Failure to incorporate such regional heterogeneity can falsely attribute home-price changes driven by other factors to the property-tax experiment, creating biases on the estimators.

Instead, our approach focuses on the correlation pattern between the treatment group and control group before the policy intervention. Hence, it allows for the impact of underlying factors to vary by city/province. Also, our approach puts more weight on control cities/provinces more relevant to the treatment cities, unlike the DID approach that assigns the same weight to each control-group member. For example, Jiangsu, as a neighborhood province of Shanghai, gets more weight than Heilongjiang when both serving as control provinces for Shanghai. These details are carefully presented in an econometric model in Section 2. The model extends from HCW (2012) without relying on a key assumption (i.e., no need of HCW's Assumption 6). We show that, as long as the price series are non-stationary, the OLS estimation generates consistent estimators for the correlation, for hypothetical prices, and therefore for the treatment effect of the property-tax experiment.

When applying this approach to China's home price data, perhaps surprisingly, we find totally opposite effects of property taxation on home prices in Shanghai and in Chongqing. The estimates suggest the property-tax experiment has *lowered* the Shanghai average home price by 11%–15% but *raised* the Chongqing average home price by 10%–12%. These results stay quite robust to various estimation specifications and to stationary versus non-stationary data. A close examination of the policy shows taxation specifics differ for the two cities. In Chongqing property taxes are mainly imposed on high-end properties including single family houses, big apartments, and those much more expensive than the city average. We propose the positive effect of property taxes on home prices in Chongqing, opposite to that in Shanghai and counter-intuitive according to the literature of property-tax capitalization, is driven by a spillover effect from high-end to low-end properties. Intuitively, people quit buying high-end homes, turn to low-end ones to avoid future property-tax payments. This lowers prices of high-end houses but raises those of low-end ones. A simple examination of data on prices by home type supports our hypothesis.

In this paper we show that the HCW (2012) approach is also applicable to evaluate policy impact when data are non-stationary, which should be a valuable tool for studying Macroeconomic policies. Moreover, it provides an important suggestion for housing policies currently under intensive discussion in China. In the past ten years China has experienced a dramatic increase in home prices. The magnitude has been astonishing: it is said that the national average home price has tripled from 2005 to 2009. The increase in home prices has dominated that in the household income: the ratio of median housing price to median annual disposable household income, a standard measure for housing affordability, equals 27 in Beijing, five times of the international average.[3] Under such circumstances, this policy experiment was implemented at the purpose of exploring property taxation as a policy tool to lower home prices. Although this paper does not evaluate many other impacts of property taxation on, for example, local public services, national investment rate, and social welfare, it does offer an important piece of advice for future property-tax policy. That is, property taxation should be implemented very carefully if it is for the purpose of stabilizing home prices. In particular, we should be cautious in following Chongqing by imposing discriminative property taxes based on home types, because this can generate a spillover effect and cause consequences opposite to what the government intends for.

We would like to mention that one can also use the synthetic control method suggested by Abadie et al. (2010) to analyze the property tax effects on housing price. However, the synthetic control method is computationally more demanding. Also, our experience suggests that the synthetic control method often lead to similar estimation result as HCW (2012) method. Therefore, we will focus on using HCW (2012) method in this paper. The rest of the paper is organized as follows. Section 2 lays out the econometric model. Section 3 describes the data. The estimation results are discussed in Section 4. Section 5 explores the potential spillover effect in Chongqing. We conclude the paper in Section 6.

2. The model

Let P_{it}^1 and P_{it}^0 denote city i's (average) home price in period t with and without property taxes, respectively. The property tax policy intervention effect to city i at time t is

$$\Delta_{it} = P_{it}^1 - P_{it}^0. \tag{2}$$

However, we do not simultaneously observe P_{it}^0 and P_{it}^1. The observed data are in the form

$$P_{it} = d_{it}P_{it}^1 + (1 - d_{it})P_{it}^0, \tag{3}$$

where $d_{it} = 1$ if the city i has the property tax (under treatment) at time t, and $d_{it} = 0$ otherwise.

Following HCW (2012) we assume that there exists a $K \times 1$ vector of *unobservable* common factors f_t that drives home prices of all cities to change over time. In our application, these can be national economic growth, macro policies, borrowing opportunities, environmental improvements, and changes in public expectations. Apparently, in this case f_t is more likely to be non-stationary, its

[2] Both Shanghai and Chongqing governments use the proper-tax revenue to finance the construction of subsidized rental houses for the poor. Since these houses are at the very low end of housing supply and therefore are poor substitutes for commercial housing, this should not influence the value of commercial housing and thus cannot bias our estimates.

[3] See the 8th annual demographia international housing affordability survey published by the Wendell Cox Consultancy (Cox and Pavletich, 2012). A ratio below 3.0 is considered as "affordable" and that above 5.1 is "severely unaffordable". This ratio ranges from 2.7 to 3.1 for the US.