

PLC Working Paper

w023

2009.08



北京大学-林肯研究院 城市发展与土地政策研究中心

PEKING UNIVERSITY - LINCOLN INSTITUTE

Center for Urban Development and Land Policy

Capitalization of Local Taxation and Public Spending on Housing Values: Evidence from China

PLC WORKING PAPER SERIES NO.023

http://www.plc.pku.edu.cn/en_publications.aspx

2009.08

Joyce Yanyun Man

Peking University – Lincoln Center

College of Urban and Environmental Sciences, Peking University

Siqi Zheng

Institute of Real Estate Studies, Tsinghua University

Peking University – Lincoln Center

Leo KoGuan Building, Suite 508, Peking University, Beijing 100871, China

The views expressed herein are those of the author(s) and do not necessarily reflect the views of the Peking University – Lincoln Center or any other associated institution. The author(s) and the Peking University – Lincoln Center jointly own all rights to this working paper. This working paper, its content, and any associated data may not be used without the express written consent of the author(s) or the Peking University – Lincoln Center, and any reference must provide full credit to both the author(s) and the Peking University – Lincoln Center.

Capitalization of Local Taxation and Public Spending on Housing Values: Evidence from China

Joyce Yanyun Man, Siqi Zheng

1 Introduction

This paper analyzes the effects of local taxes and public spending on property values using data from Chinese cities in an attempt to test the Tiebout hypothesis.

According to Tiebout (1956) model, consumers “shop” among different communities offering varying packages of local public services and selects as a residence the community which offers the tax-expenditure program best suited to their tastes. His model implies at least at a theoretical level there may exist a system that resembles a market solution to the production and consumption of local public goods that leads to the efficient provision of public goods and services. However, this hypothesis is based upon the assumptions that consumers are fully mobile and have perfect knowledge concerning local revenues and expenditures, a large number of communities exist for consumers to choose among, there are no community-based employment restrictions, there are no externalities associated with local public service provision and communities are sized so that they can produce services at the minimum of their average cost curve. In the U.S. there is a vast number of studies examining the capitalization of property tax, because it is the mainstay of local revenue systems in U.S. Unfortunately empirical literature yields contradictory results concerning the extent to which property taxes are capitalized. If a property tax change is fully capitalized, the selling value of the asset is reduced by the present discounted value of the tax. Hamilton (1976) argues that public goods financed with property tax can be provided efficiently and the property tax is non-distortionary. Fees for public services. However the “new” view of Mieszkowski(1972) and Aaron(1975) argues that capital owners bear the full burden of a uniform property tax and is progressive, while tax differentials between communities give rise to “excise” effects that may shift forward to higher housing prices or shifted backward to a relatively immobile factor. Mieszkowski and Zodrow(1989) argue that under the new view, higher property tax rate in the metropolitan will reduce the national average rate of return on capital and there is a tendency toward under-provision of local public services, because local jurisdictions are reluctant to tax mobile capital.

The bid-rent model developed by Yinger (1982) suggest that the amount a household is willing to pay for a unit of housing services in a particular jurisdiction, is based on the jurisdiction’s level of services and taxes. Yinger (1985) argues that the average tax rate in the metropolitan area is distortionary but the variations from this base tax rate will be perfectly capitalized into housing values. Relatively high property tax rate in one jurisdiction will not repel capital, since the rate will be fully

capitalized into immobile factors. He draws conclusions that differences in service levels between jurisdictions will be inexactly capitalized, depending upon taste parameters in the utility functions, but the differences in tax rates between communities will be fully capitalized, regardless of the tastes of consumers. If the price of housing is different in different jurisdictions, suppliers will have an incentive to supply houses to jurisdictions with high home values. In the long-run equilibrium, local fiscal variables will be capitalized into house values.

A large number of capitalization studies have centered upon the estimation of the degree to which property tax differences are capitalized into property values. If the difference in price between two otherwise identical properties is equal to the present discounted value (PDV) of the tax differential, the full capitalization of the property tax differential occurs.

The seminal capitalization study by Oates (1969) studies 1960 census data of fifty-three municipalities in northeastern New Jersey. Oates finds that a higher tax rate depresses house prices and that increased school spending increases the price of housing. Using a discount rate of 5% and 40-year time horizon, he finds that tax differentials are fully capitalized. Under a 3% discount rate and an infinite house life, the capitalization percentage is 61%. In the subsequent years, there are many researchers trying to measure the degree of capitalization of the property tax. Due to the methodological difficulties and data limitations and other unobservable factors, the empirical capitalization literature has resulted in widely varying results of the rate of capitalization.

This study aimed to estimate the rate of capitalization of local taxes and public spending using the data for over 200 Chinese cities. In China, all tax rates are determined by central government, and each provincial/local government is assigned a share of revenue collections within its boundaries. Tax administration is a shared responsibilities between central and local governments. The central government is exclusively entitled to impose taxes, and only provincial level of government can make decisions with respect to tax rates within the limits set by the central government. Unlike Local governments in the U.S. that relies heavily on property tax for local public finance, Chinese local governments have all land and property tax revenue as well as business tax, income tax from local enterprises, personal income taxes, receipts of land leasing and transfers, estate tax, stamp tax.

In this study, we regress the median home value of Chinese cities on the local taxes and public spending as well as other factors identified to influence the housing price of a jurisdiction. The results from this study aims to make a significant contribution to capitalization literature. First, previous research on the capitalization theory still have not reached a consensus. Empirical evidence from China shall add to the debate upon the incidence of the local taxes such as property tax and the extent of capitalization of local fiscal policies. It may provide empirical evidence on the validity of Tiebout Hypothesis in a non-U.S. environment. Second, the empirical studies using U.S. data suffer from the endogeneity problem that is fundamental to this literature because the median home value and the tax rate term are simultaneously determined due to the residual property tax system and the definition of the effective

tax rate often used by researchers in their capitalization study including Oates(1969). It is difficult to determine the direction of causation between tax rates and home values. However, in China the tax rate is exogenous because it is set by the Central government and selected by the provincial government, The local government in China may have varying efforts in administrating and collecting the tax revenues. Our sample of data is for 220 cities in 31 provinces, allowing for a large amount of sample variation in local tax rate and public spending. Third, the local governments in China also administer taxes other than the land and property taxes such as value added tax and business tax and corporate and personal income tax. The impact of these taxes on housing value may lead to a broad discussion of the degree of substitution between the various inputs at different sectors (industries).

According to Gravelle (1994) when there are other taxes on capital, most notably the corporate income tax, housing, especially owner-occupied housing, is taxed at a very low rate compared to other forms of capital, The property tax actually help to correct the misallocation of resources resulting from the corporate income tax.

2 Models and Specification Issues

This study explores the effects of various taxes, other revenues and public expenditures on residential property values in Chinese cities.

The current official statistical system does not report city-level median or mean home values. Our advantage is that we have access to a large-scale Urban Household Survey (UHS2007) conducted in 2007, which contains the current market values of the households' homes at the end of 2006. Median home value for every city is calculated based on this micro dataset (See Section III for details). Since we only have the home value data for 2007, we collect the fiscal variables for 2006 and estimate the following cross-section regression equation:

$$\ln(HV_{i,t}) = \alpha + \beta T_{i,t-lag_period} + \gamma E_{i,t-lag_period} + \delta Z_{i,t} + \varepsilon_i \quad (1)$$

Where HV_i is median home value in city i . T_i is the vector of tax structure variables. E is the vector of local public spending variables. Z_i is the set of other variables that are believed to affect home value variations across cities. ε_i is the error term.

To mitigate the possible endogeneity problem between home value and taxes and expenditures, we include lagged indicators of local taxes and expenditures on the right-hand side of Eq. (1). Home value (HV) is of year 2007 ($t=2007$), and the tax and expending indicators are of year 2006 or 2005 ($lag_period = 1$ or 2).

3 Data and Hypotheses

Equations (1) is estimated using cross-sectional data for 2006 for 238 cities of prefecture level or above in China¹. The data were taken from the 2007 large-scale

¹ There are 255 prefecture-level cities in China in 2006. Some key variables are missing for 17 cities. Therefore, the final regressions have 238 cities.

Urban Household Survey (UHS2007) conducted by National Bureau of Statistics of China (NBSC), China Urban Yearbooks, and China Fiscal Yearbooks. Table 1 shows the descriptive statistics of the variables used in this study.

Urban Household Survey (UHS) is conducted annually by the Urban Survey Department of the National Statistic Bureau of China (NSBC). The sample size is about 50 thousand. In 2007, the Bureau conducted a large-scale survey, which covers all of the 255 prefecture-level cities in China (shown in Map 1) and has a sample size of 300 thousand households. Chinese cities have a 3-tier sub-municipal administrative structure: the first tier is district, or *Qu*, the second tier is street block, or *Jiedao (JD)*, and the third tier is street neighbourhood, or *Juweihui (JWH)*. Beijing, for example has 18 *Qu*'s, 130 *JD*s and 2,625 *JWH*s in 2006. The 2007 UHS employed the 3-stage stratified sampling method. First, *JD*s in each city are sorted by their identification (ID) numbers and sampled at fixed distances; Next, *JWH*s in each selected *JD* are sorted by their ID number and are sampled at fixed distances; Finally, 20-40 households are randomly sampled in each selected *JWH*. The selected household reported its annual household income, household head's education attainment, the size and the current market value of the housing unit. The current market value was estimated by the interviewer using a simple market comparison approach.



Figure 1 255 Cities of prefecture level or above in China

The dependent variable is measured as city median home value (per housing unit) in logarithm in Equation (1). The median home in the average city has a value of 179 thousand RMB. The most expensive city has the median home value of 690 thousand RMB.

The explanatory variables fall into three categories: (1) taxes and other revenues; (2) public expenditures; and (3) Economic and demographic characteristics, industrial composition, housing market attributes and city/region dummies.

The total fiscal revenue is disaggregated into VAT, business tax, corporate income

tax, personal income tax, and other taxes/revenues. Local public expenditure is disaggregated into education expenditure, infrastructure expenditure and other expenditures. Tax variables are measured as per capita tax revenue or the ratio of the tax revenue to GDP as a measure of average tax rate. Public expenditure variables are measured as per capita expenditure. In 2006, the average city yields the fiscal revenue of 4072 RMB, and expends 5920 RMB. Regarding the tax structure, business tax takes the largest share (23.0%), and individual income tax has the smallest share(4.1%). On average, 20.3% of the total fiscal expenditure is spent in education.

Ideally, we would like to have a measure of various effective tax rates, per se. However, any attempt to use statutory tax rate schedules in constructing a measure of effective rates across Chinese cities is problematic because of the substantial non-uniformity of enforcement practices and variations in rate structures of some taxes across regions in China. As an alternative, tax revenues from various taxes as a share of GDP in each city is used as tax rate proxies.

In variable group (3), we include each city's economic and demographic characteristics, such as median annual household income, GDP, population, human capital level (average years to schooling), the shares of primary and secondary industries in each city's GDP. We also include two housing market variables: share of commodity housing in total housing stock, and median housing unit size. The cities with larger shares of commodity housing are expected to have higher home values because commodity housing is newer and more expensive than average housing stock. The cities with larger houses on average should also have higher home values. The regression results are discussed in the following section.

Table 1 Descriptive Statistics of City-specific Variables.

Variable	Abs.	Maximum	Minimum	Mean	Std.dev.
<i>Dependent Variable</i>					
Median home value (thousand RMB) ^a	HV	690	50	175.9	108.8
<i>Explanatory Variables</i>					
<i>(1) Taxes and other revenues</i>					
Fiscal revenue per capita (thousand RMB) ^c	REV_PC	44.923	0.375	6.844	6.086
Fiscal revenue as a ratio to GDP	REV_RATIO	0.820	0.029	0.142	0.097
VAT tax per capita (thousand RMB) ^c	VAT_PC	8.924	0.079	1.302	1.409
VAT tax as a ratio to GDP	VAT_RATIO	0.242	0.003	0.027	0.025
Business tax per capita (thousand RMB) ^c	BTAX_PC	10.195	0.070	1.561	1.505
Business tax as a ratio to GDP	BTAX_RATIO	0.116	0.003	0.031	0.020
Corporate income tax per capita (thousand RMB) ^c	CITAX_PC	5.632	0.015	0.578	0.806
Corporate income tax as a ratio to GDP (RMB) ^c	CITAX_RATIO	0.061	0.001	0.010	0.009

Individual income tax per capita (thousand RMB) ^c	HITAX_PC	2.707	0.016	0.267	0.335
Individual income tax as a ratio to GDP (thousand RMB) ^c	HITAX_RATIO	0.020	0.001	0.005	0.004
Other revenue per capita (fiscal revenue per capita minus the above four categories, thousand RMB) ^c	OREV_PC	24.233	0.195	3.136	2.766
Other revenue as a ratio to GDP	OREV_RATIO	0.414	0.012	0.069	0.053
(2) Public expenditures					
Fiscal expenditure per capita (thousand RMB) ^c	EXP_PC	40.216	1.022	10.549	7.129
Education expenditure per capita (thousand RMB) ^c	EDUEXP_PC	9.702	0.052	2.368	1.908
Infrastructure expenditure per capita (thousand RMB) ^c	INFRAEXP_PC	11.405	0.004	0.963	1.242
Other expenditure per capita (fiscal expending per capita minus the above two categories, thousand RMB) ^c	OEXP_PC	43.229	0.945	9.982	6.713
(3) Economic and demographic characteristics, industrial composition, housing market attributes, city/region dummies					
Median annual household income (thousand RMB) ^a	HINC	80	14.4	30.55	5.19
City Gross Domestic Product (trillion RMB) ^b	GDP	10.26	0.02	0.18	1.07
City non-agriculture population (million) ^b	POP	13.68	0.17	3.52	2.42
Average years to schooling (year) ^a	EDU	13.54	10.09	12.04	0.60
Primary industry's share in GDP (%) ^b	IND1	31.67%	0.12%	4.67%	6.85%
Secondary industry's share in GDP (%) ^b	IND2	89.72%	20.93%	51.05%	12.50%
Share of commodity housing in total housing stock (%) ^a	COMHOUSE	73%	1%	31%	15%
Median housing unit size (square meter) ^a	HSIZE	161.51	55.55	88.43	17.89
Dummy variable. 1=Beijing; 0=otherwise.	BEIJING	1	0	--	--
Dummy variable. 1=Shanghai; 0=otherwise.	SHANGHAI	1	0	--	--
Dummy variable. 1=city in eastern region=1; 0=otherwise.	EAST	1	0	0.432	--

Data sources: a: 2007 UHS; b: China Urban Statistic Yearbook; c: China Fiscal Statistic Yearbook.

4 Empirical Results

Table 2 presented the regression estimation of the property value equation for the sample of this study. Our explanatory variables can explain 60%+ of home value variation across cities.

Table 2 Capitalization of Fiscal Variables in Home Values: Aggregate tax and expenditure indicators
Dependent variable: Log(HV2007)

	Eq. (1)	Eq. (2)
Explanatory variable	Coefficient (t-stat.)	Coefficient (t-stat.)
Constant	-5.909 (-6.6)***	-5.956 (-6.7)***
Ln(HSIZE)	0.512 (3.7)***	0.522 (3.8)***
Ln(HINC)	0.520 (4.9)***	0.505 (4.8)***
Ln(REV_RATIO ₂₀₀₆)	-0.002 (-0.0)	
Ln(EXP_PC ₂₀₀₆)	0.338 (5.4)***	
Ln(REV_RATIO ₂₀₀₅)		-0.073 (-1.5)
Ln(EXP_PC ₂₀₀₅)		0.373 (6.5)***
Ln(POP)	0.228 (5.4)***	0.223 (5.3)***
EDU	-0.031 (-0.8)	-0.032 (-0.9)
IND1	-0.008 (-1.7)*	-0.009 (-2.0)**
IND2	-0.002 (-1.1)	-0.003 (-1.5)
COMHOUSE	0.312 (2.1)**	0.302 (2.0)**
EAST	0.185 (3.7)***	0.192 (3.9)***
BEIJING	0.068 (0.2)	0.067 (0.2)
SHANGHAI	-0.136 (-0.4)	-0.117 (-0.4)
R squared	0.654	0.655
No. of observations	229	229

According to regressions results from Equation 6 in Table 3, the variable of our primary interest, the per capita expenditure, has a positive and statistically significant coefficient estimate, indicating that the level and quality of public goods and services are reflected into the home value of a city in China. A 10 percent increase in per capital public spending leads to nearly 4 percent increase in residential home value, everything else being constant. This result suggests that Chinese consumers do take into account of the provision of local public goods and services in their location choices. A City with a higher per capita public expenditure is resulted in a higher value of houses. In China sub-national government spending account for nearly 70 percent of total public spending and there exists a vast disparity in quality and quantities of public goods and services including public housing, social security, public health, education and civil services among others. It may demonstrate that with rapid urbanization and increasing household mobility, the differences in services among cities in China are capitalized into home values. It provides empirical evidence

that even if in an environment where the set of assumptions of Tiebout model are unrealistic or too restrictive, Tiebout hypothesis is still relevant in China. It supports the Tiebout hypothesis by demonstrating that consumers or households in China do consider the available programs of public services in their choices of locality of residence. So other things being equal (including tax rates), the communities that offers more attractive package of public goods and services results in higher gross rents and therefore property values would be higher in a community. As a result, the outputs of public services influence the attraction of a community to potential residents and thereby affect local property values. This result confirms Yinger's theory that individual families desiring to consume higher levels of public output, would presumably tend to bid up property values in communities with high-quality programs of public services, affecting locational decisions of consumers or households.

However, the total local revenue as a share of GDP in a city has a negative sign but statistically not significantly different from zero at 10 percent level. This result may be caused by the possible competing effects of multi tax structures and rates used by the local governments in China. Unlike the U.S. where the local property tax accounts for roughly 75 percent of revenues on average, the tax on the value of land and structure as a property tax accounts for a small share of tax revenue. There is no tax on the value of owner-occupied residential housing. As a result, the property tax in China does not fully reflect the average cost of the local public goods and services. Consequently, a package of local taxes used in the financing of public goods and services in a Chinese city are included in the estimation equation of the residential housing value equation to better measure the differential impacts of varying taxes.

The income elasticity of housing demand is about 0.3-0.5, which is consistent with Zheng (2007) who estimates the elasticity using micro household data in Chinese cities. Larger homes have higher values. All else equal, a 1% increase in housing unit size results in a 0.5% increase in home value. Larger cities in terms of non-agriculture population have higher home values. All else equal, a 10% population growth causes 1.5% home value appreciation. Cities with larger shares of tertiary industry also have more expensive homes. Consistent with our intuition, cities with larger shares of commodity housing have significantly higher home prices.

Table 3 Capitalization of Fiscal Variables in Home Values: Disaggregate tax and expenditure indicators

Dependent variable: Log(HV2007)

	Eq. (3)	Eq. (4)
Explanatory variable	Coefficient (t-stat.)	Coefficient (t-stat.)
Constant	-3.845 (-4.4)***	-4.198 (-4.9)***
Ln(HSIZE)	0.472 (3.6)***	0.458 (3.6)***
Ln(HINC)	0.331 (3.2)***	0.358 (3.6)***
Ln(VAT_RATIO ₂₀₀₆)	-0.040 (-0.8)	
Ln(BTAX_RATIO ₂₀₀₆)	0.232 (3.7)***	
Ln(CITAX_RATIO ₂₀₀₆)	0.162 (3.8)***	

Ln(HITAX_RATIO ₂₀₀₆)	-0.150 (-2.7)***	
Ln(OTAX_RATIO ₂₀₀₆)	-0.289 (4.7)***	
Ln(VAT_RATIO ₂₀₀₅)		-0.074 (-1.5)
Ln(BTAX_RATIO ₂₀₀₅)		0.311 (5.0)***
Ln(CITAX_RATIO ₂₀₀₅)		0.153 (3.5)***
Ln(HITAX_RATIO ₂₀₀₅)		-0.152 (-2.7)***
Ln(OTAX_RATIO ₂₀₀₅)		-0.281 (4.6)***
Ln(EDUEXP_PC ₂₀₀₆)	0.066 (0.9)	
Ln(INFEXP_PC ₂₀₀₆)	0.033 (2.0)**	
Ln(OEXP_PC ₂₀₀₆)	0.259 (2.7)***	
Ln(EDUEXP_PC ₂₀₀₅)		0.012 (0.2)
Ln(INFEXP_PC ₂₀₀₅)		0.034 (1.8)*
Ln(OEXP_PC ₂₀₀₅)		0.340 (4.1)***
Ln(POP)	0.195 (4.7)***	0.208 (5.3)***
EDU	-0.023 (-0.7)	-0.027 (-0.8)
IND1	-0.006 (-1.3)	-0.006 (-1.3)
IND2	0.000 (0.1)	0.001 (0.4)
COMHOUSE	0.167 (1.2)	0.128 (0.9)
EAST	0.184 (3.9)***	0.198 (4.4)***
BEIJING	-0.111 (-0.4)	-0.213 (-0.7)
SHANGHAI	-0.225 (-0.7)	-0.267(-0.9)
R squared	0.724	0.714
No. of observations	229	229

Table 3 presents the estimation results of the residential housing value equation with varying local tax structures and rates and different public service programs. The tax variable estimates suggest that the taxes on proceeds or capital gains of property sales through business tax and tax on enterprise income tax have statistically significant positive effects on residential housing value, while taxes on household income through the personal income tax and other local taxes and fees via urban real estate tax and the tax on land use and appreciation and non-owner occupied property taxes have negative and statistically significant effect on house value. It may well be likely that everything else constant, the higher taxes on business capital as a profit and during the transaction stage cause the flee of capital to housing sector, providing incentives to more supply of capital to housing construction, and consequently conversation of more non-residential land into residential land. With high demand for housing due to urbanization and rapid income growth, the median house value increases. According to Gravelle (1994) when there are other taxes on capital, most notably the corporate income tax, housing, especially owner-occupied housing, is taxed at a very low rate compared to other forms of capital. The property tax actually helps to correct the misallocation of resources resulting from the corporate income tax.

Not surprisingly, the tax on personal income tax reduced the median house value of a community. It may be well likely that the personal income tax burden on households depresses the purchasing power of the consumers, leading to lower property value in the community via the demand side effect.

The other local taxes including those on the value of real estate in the urban areas results in a statistically significant negative effect on property value. This result is consistent with the empirical results of many previous researchers, suggesting that the differences in local taxes are capitalized in the value of residential housing.