A microsimulation of property tax policy in China

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**Abstract**

China is exploring possible property tax reform to stabilize the booming housing market as well as providing sustainable revenue for the local government. In this paper we develop a theoretical model of property tax reform to decompose potential impacts of property tax reform in China. Then we used the China Family Panel Survey (CFPS) data to conduct a microsimulation model to examine potential impacts and incidences of alternative property tax designs in China. Our analyses suggest that a uniform property tax policy would bring substantially heterogeneous impacts across different income groups as well as different regions, mainly due to the differences in income distribution, housing prices and the degree of the Housing Demolition program. In terms of property tax incidence, our simulation suggests that utilizing tax revenue on the poor’s public housing subsidy may mitigate the regressivity; in some case may even increase the overall social welfare. Finally, we use the cross-sectional information in the Chinese Family Panel Survey (CFPS) data to simulate for optimal tax scenarios for each region. Our microsimulation results provide some initial quantitative analysis in the literature and may shed some light on understanding the impacts of future property tax reform in China.

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1. Introduction

With the housing boom for the last decade, China has been involved in active discussion about imposing the property tax or real estate tax to stabilize the housing market. Property tax is quite common in many developed countries, as a primary source of tax revenue for the local governments for the provision of local public goods, such as public school, police system and etc. However, in China, property tax still has not been implemented yet, except some real-estate related taxes charged at the point of transaction.

Recently, due to the concern about soaring housing bubble, tight local government budget, rising income gap between the rich who own many houses and the poor who can hardly afford the rent, some pilot reforms of property tax was implemented in Shanghai and Chongqing in 2011. Before these experiments, property tax was just applied to some business buildings or to the foreign companies in China. Right now, whether these pilot programs should be extended to the whole nation is still a highly debated open question. Experiences from the developed world, such as US and OECD countries, have provided some empirical evidences that property tax can play a significant role in controlling the housing price, restraining certain speculative behavior (Kuang et al., 2012).

Therefore, an open question is, if China implement the property tax, how would various households being affected under this new reform? Will they get worse off since their out of pocket money will increase for paying the new tax? If the landlord raise the housing rent, in an inelastic rental market, renters may bear most of the burden, so it is likely

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to be regressive. However, it might not be exactly true, since some poor households may get better off if they are the beneficiaries of extra revenue spent on local public goods. That is, the local government now with more local tax revenue may provide more local public good, like better public primary and middle school, or increase supply of cheaper subsidized housing projects for the poor. Unfortunately, the experiments in the two pilot cities (Shanghai and Chongqing) have not shed much light on potential distributional effects considering such a diverse distribution of rich, medium and poor cities as well as big income gap between the poor and rich in China. Therefore, given the heterogeneity nature of the local property tax policies, how to design a proper property tax reform is also the key to the success of this policy. If we take both equity and efficiency criteria into consideration for the property tax reform, how should we implement the property tax in China?

To address these issues, in this paper we exploit a micro data from the China Family Panel Survey (CFPS) to simulate for possible outcomes of various property tax policies in China. We then use the microsimulation results to compare the effects of various property tax regimes regarding different designs on tax bases, tax rates as well as recycling policies. Our results show that, given China’s broad spectrum on the housing market, and increasing gap between the rich and poor, a uniform property tax may not be appropriate for China, it is important to take into account many local factors such as local housing prices, inequality patterns, to design more appropriate tax policies and recycling regimes to achieve better policy outcome in practice.

2. Literature review

The impact of property on property value has been widely studied in the developed countries. Three alternative views of the incidence of property tax have been discussed in the literature: the “traditional view”, which argues that the property tax would fully shift forward to consumers in the form of higher housing prices; the “benefit view”, which suggests that the property tax is simply a payment for local public services, and finally the so-called “new view” of the property tax, which argues that property tax is implicitly a distortionary tax on the use of capital within a local jurisdiction.

The traditional view dates back to Simon (1943) and Netzer (1966), who took a partial equilibrium approach to analyzing the tax, focusing on the effects of increasing the tax in a local housing market. The burden of the tax is borne by consumers, and the traditional view argues that this entire burden is borne by local housing consumers in the form of higher housing prices, therefore implying that the property tax inefficiently reduces the size of the local housing stock and its burden is borne in proportion to housing consumption.

However, the “benefit view” argues that the property tax is beneficial to the consumers. This view was developed initially by Hamilton (1975, 1976), Fischel (1974) and White (1975), and is reviewed by Hamilton (1983). This view is an extension of the famous Tiebout Model. Tiebout (1956) first mentioned the concept of “voting by feet”, which suggests that if consumers are fully mobile, then they will move to the community where their preference patterns are best satisfied. Because of the tax completion among the communities, the local governments have more incentives to supply public goods and lower the tax rate. Tiebout ignored local property taxation and instead assumed the existence of benefit taxes is implicitly in the form of head taxes. Following Tiebout, Hamilton assumed that individuals are sorted into local jurisdictions according to their demands for local public services, and that there are enough local tax expenditure packages to accommodate the heterogeneous individual preference. Hamilton argued that such a “perfect capitalization” converts the property tax into a benefit tax, at least in the long run equilibrium (but not at the time when a tax change occurs and is capitalized into property values). Yinger et al. (1988) have found empirical evidence that property taxes and local public service expenditures are capitalized into house values, as predicted by the Hamilton model. The implications of this “benefit view” are striking. First, it means that the property tax is effectively a user charge that is paid in exchange for the benefits of local public service. It is thus a nondistortionary tax. Second, as a benefit tax, the property tax has no effects on the distribution of income.

The “new” view of the property tax, first developed by Mieszkowski (1972), subsequently extended by Zodrow and Mieszkowski (1986), argues that the property tax is a distortionary tax on the local use of capital, which results in a misallocation of the national capital stock across local jurisdictions. Mieszkowski (1972) stressed that the partial equilibrium analyses of the property tax that characterized the traditional view was misleading, since it ignored the fact that the property tax was used by virtually all local jurisdictions and applied to a large fraction of the capital stock. Zodrow and Mieszkowski (1986) suggest that the use of a distorting property tax on mobile capital decreases the level of residential public services.

From the theoretical perspective, higher property tax will lower the property value. Oates (1969) uses the data set of 53 northeastern New Jersey communities for the year of 1960, and finds that the property tax has a negative effect on the property value. Palmon & Smith (1998) follow the work done by Oates, and specify the importance of capitalization; they also find the tax has a negative effect. Bai and Ouyang (2014) exploit the effect of property tax on the housing price, taking advantage of a policy experiment of property taxes in Shanghai and in Chongqing starting from January 2011. The counterfactual housing prices in Shanghai and Chongqing without the tax are estimated by the housing prices of the strongly correlated provinces using a long monthly time series data. They find that the tax lowers the average housing price by 15% in Shanghai.

The decline in property value may further drag down the consumption through the “housing wealth effect”. Harberler (1958) first put the property value into a consumption model, and notice that the change of the housing price will change the wealth of the residents. Then the residents will adjust their consumption choice as well. Ludwig and Slok (2002) specify the realized wealth effect and the unrealized wealth effect. Two channels through which the
property value will affect the consumption choice are figured out: Liquidity constraints effect and Substitution effect. A lot of literatures have discussed how the property value will affect the consumption choice. (Muellbauer, 2007; Muellbauer and Murphy, 2008; Iacoviello, 2011). Case and Quigley (2005) use the quarterly panel data of U.S. states during the 1980s and 1990s, and found that in the U.S., the marginal propensity to consume with respect to the property value is about 0.06. However, in China these so called “housing wealth effects” are more complicated. Du Li (2010) uses a panel data with 172 cities in China from 2002 to 2006, and finds that the increase of the housing price actually decreases the total expenditure of the residents. They argue that, unlike US, Chinese house owners are more likely to be the potential buyers later, so the rising housing price may further crowd out consumption expenditures, so they can save more to buy more apartment. In a recent paper, Yang (2014) considers the dual characters of the housing in China: both a consumption good and an investment good. She argues that living in a house the residents not only pays the renting cost but also pays the opportunity cost. The opportunity cost in China, however, is much higher, compared to the renting cost, when property tax is non-exist. According to Yang’s estimate, the elasticity of the property value on the expenditure is –12.3%. They also highlight that, the heterogeneity in China makes it much harder to estimate the house wealth effect.

Microsimulation is a useful tool for evaluating policies. Microsimulation models allow simulating the effects of a policy on a sample of economic agents (individual, households and firms) at the individual level. Bourguignon and Spadaro (2006) mentioned that the usefulness of microsimulation techniques in the analysis of public policies has two aspects. First is the possibility of fully taking into account the heterogeneity of economic agents observed in micro-datasets. Second is the possibility of accurately evaluating the aggregate financial cost/benefit of a reform. Microsimulation is widely used in welfare accounting and policy evaluating. Immervoll and Kleven (2007) use the method to compares the effects of increasing traditional welfare to introducing in-work benefits in the 15 countries of the European Union. By the microsimulation model, they can quantify the equity-efficiency trade-off for a range of elasticity parameters and get the results. For the housing market, Brownstone and Englund (1985) use the microsimulation method to estimate the effects of the Swedish 1983–85 tax reform on the demand for owner-occupied housing.

In this paper, we apply the Slesnick–Jorgenson model to calculate the changes in social welfare by combining both the efficiency and distributional equity criteria. The social welfare function was first introduced by Jorgenson and Slesnick (1983). This translog function is widely used in estimating the welfare change caused by policies. It considers both efficiency and equality, and the income distribution is implicitly incorporated in the welfare calculation. Currently, this method was been applied to estimate the influence of the petroleum tax and natural gas price regulation on the social welfare in the U.S. (Jorgenson and Slesnick 1985a, 1985b).

3. The pilot property tax reform in China

In 2011, a policy experiment of property tax took place in Shanghai and Chongqing. Before that, property tax was just charged on the foreign companies in China. The main goal to impose property tax is to stabilize the housing price and increase the financial income of the local governments. The two pilot experiments did have some impacts on the property value. The central government in China has not yet decided whether to impose the property tax at nation-wide, but the new housing registration system and network is currently under development to prepare for the future property tax reform. There are four major issues to consider before the implementation of property tax.

The first issue is about the tax base. In the U.S., the tax base is the total value of the houses. However, in China, it may be politically difficult to use housing value as tax base. Such a tax would impose a very high burden for many households, especially the poor who own the house but may purchase earlier when the housing price is relatively low. At the tax rate of 0.5%, a household with a house of $200,000 will have to pay $1000 per year. However, the average income per household in China in 2014 is only about $15,000, which means the property tax may lower the expenditure by 6.7%. Second, fairness is always an important concern of the tax. The ratio of the property value to the total wealth is likely to decrease as the total wealth increases. So if we use the total value of the houses as the tax base, then the property tax is more likely to be a regressive tax. Third, in order to win more political support, it is likely for the government to set a level under such standard the property tax is waived, why above which the owner has to pay for the extra tax, as implemented by the pilot projects in Shanghai.

The second issue to consider is the tax rate. If the tax rate is too low, it cannot achieve the goal to stabilize the housing price. If the tax rate is too high, the property tax would crowd out the consumption, and worsen the economy. In addition, a high property tax rate may lower the property value by a large amount, which may hurt the industries not only real estate, but also construction, iron and steel, cement, as well as all the other industries in a chain. In some cases, the sharp decline in property value may even trigger financial crisis, as the Asian financial crisis happened in 2008. Still very few paper debate on what would be the optimal property tax, but in practice it has been widely accepted that it should be around 1%.

The third issue to consider is whether to set a uniform rule of property tax policy on the whole China? In China, regional disparity is becoming more and more severe. Except Beijing, Shanghai, Shenzhen and Guangzhou, there is a surplus of housing in many medium and small cities. Therefore, a uniform tax rate of 0.5% or 1% may even lead the real estate market crash and the ratio of empty apartment rising. So whether to impose a heterogenous property tax and let the local government to determine is also an open question to ask.

The fourth issue is to determine how to use the income from the property tax. In the U.S., property tax is the major income resource of the local governments; most of the income from the property tax is spent on the local
public goods like education. In China, how to use the income remains under debate. In the policy experiment in Shanghai, the income was used for the supply of the public renting houses for low income groups. So it is also a debate whether to use property tax revenue to subsidize education or to subsidize public renting houses is also an open question.

Though the exact proposal of implementing property tax remains unknown yet, there is a high expectation that the property tax will be implemented in near future. The central government of China has decided to form the real estate registration system, and the system begins to work at March 1st 2015. This system is believed to build as an infrastructure for the next step of property tax reform for the whole country.

To shed some lights on potential impacts of property tax reform in China, next we describe a theoretical model, then we will conduct a micro-simulation model using the household housing survey data to simulate for potential impacts.

4. The model

Consider an economy with $J$ cities. In city $j$, there are $N_j$ households. We assume that capital is mobile. Each household $i$ consumes three kinds of goods, housing service $x_{ij}$, numeraire non-housing goods $x_{2ij}$ and local public goods $LG_{ij}$. We assume that each household $i$ has a preference on city $j$, $e_{ij}$, which is different among households and cities. The distribution of $e_{ij}$ is continuous. Though the household $i$ may gain different incomes in different cities, the differences are not influenced by property tax and somehow can be reflected in the taste term $e_{ij}$. Then without loss of generality, we can assume the household $i$ gains the same income in all the cities.

We first focus on the consumer behaviors. The migration effect will be discussed later.

$$\max u_{ij} = \theta \cdot \ln x_{1ij} + (1 - \theta) \cdot \ln x_{2ij} + \mu \cdot \ln LG_{ij} + e_{ij}$$

s.t. $$(Z_j + \tau_j P_j) \cdot x_{1ij} + x_{2ij} = e_i$$ \hspace{1cm} (4.1)

The utility function of a household is in the Cobb-Douglas form, where $Z_j$ is the rent of the housing service, $\tau_j$ is the tax rate of the property tax which is 0 at first, $P_j$ is the price of houses per unit, and $e_i$ is the total expenditure of the household.

$$x_{1ij}^* = \frac{\theta}{Z_j + \tau_j P_j} e_i, \quad x_{2ij}^* = (1 - \theta) e_i$$ \hspace{1cm} (4.2)

$$\sum_{i=0}^{\infty} \frac{Z_j}{(1 + r)^t} P_j \rightarrow Z_j = r P_j$$ \hspace{1cm} (4.3)

where $r$ is the interest rate.

Houses can be treated as durable goods. The houses consumed today from the existing housing stock and newly built ones.

In the production of house, capital and land are the two main inputs. In China, the supply of land is limited by the government, which is fixed in the production. The real estate company will determine how much capital and land should be used in the production of house to maximize its profit:

$$\max \Pi_{ij} = P_j K_{ij} \gamma_{ij}^{1-\gamma} - rK_{ij} - r_{ij} L_j$$ \hspace{1cm} (4.4)

$K_{ij}$ is the capital invested in construction in city $j$, $r_j$ is the price of land in city $j$, $L_j$ is the land which is fixed.

$$K_{ij}^* = \frac{\gamma_{ij}^{\gamma}}{r} \cdot Y_{ij}^* = \frac{\gamma_{ij}^{\gamma}}{r} \cdot P_j^{\gamma}$$ \hspace{1cm} (4.5)

From the zero profit condition, we can get

$$r_j^* = (1 - \gamma) \cdot \left(\frac{\gamma}{r}\right)^{\gamma} \cdot P_j^{\gamma}$$ \hspace{1cm} (4.6)

What is the impact of property tax on property value and household utility?

We first analyze the medium and short term cases while in the long term households may migrate to other cities. We assume that, in the medium term, the households can adjust their consumption choice, while in the short term the households are unable to adjust how much housing service they consume.

For the medium term, the equilibrium of housing market clears as follows:

$$\theta \cdot \ln N^*_j = (1 - \delta) F_j + \frac{\gamma_{ij}^{\gamma}}{r} \cdot P_j^{\gamma}$$ \hspace{1cm} (4.7)

$F_j$ is the houses volume in city $j$ last period, $\delta$ is the depreciation rate. The left hand side of the equation is total demand of houses in this period and the right hand side is the total supply of the houses in this period.

We can get the derivative of property value with respect to the tax rate.

$$\frac{\partial \theta}{\partial r} = \left\{\frac{1}{P_j} (1 - \epsilon_{ep}) + \frac{\tau_j + r_j^*}{\gamma_{ij}^{\gamma}} \cdot \frac{\gamma_{ij}^{\gamma}}{r} \cdot r_j^* \right\}^{-1} \frac{1}{r + r_j^*} < 0.$$ \hspace{1cm} (4.8)

$\epsilon_{ep}$ is the elasticity of expenditure with respect to property value, as a result of housing wealth effect.

The indirect utility function of the household is

$$V_{ij} = \ln e_i - \theta \ln (r + \tau_j) - \theta \ln P_j$$

$$+ \theta \ln \theta + (1 - \theta) \ln (1 - \theta) + \mu \cdot \ln LG_{ij} + e_{ij} \hspace{1cm} (4.9)$$

$$\Delta V_{ij} = - \theta \frac{\Delta \tau}{r + \tau_j} - \theta \frac{\Delta P_j}{P_j} + \epsilon_{ep} \cdot \frac{\Delta P_j}{P_j} + \mu \cdot \frac{\Delta LG_{ij}}{LG_{ij}}$$ \hspace{1cm} (4.10)

The impact of the property tax on the household’s utility can be decomposed into four parts (Table 1). The first effect is the tax out of pocket effect. As the tax rate of the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Decomposition of the effects of property tax.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term</td>
<td>Name</td>
</tr>
<tr>
<td>$-\theta \cdot \Delta \tau/(r + \tau_j)$</td>
<td>Tax out of pocket effect</td>
</tr>
<tr>
<td>$-\theta \cdot \Delta P_j/P_j(-\theta /\Delta Z_i/Z_i)$</td>
<td>Price effect</td>
</tr>
<tr>
<td>$\epsilon_{ep} \cdot \Delta \tau/\Delta LG_{ij}$</td>
<td>Redistribution effect</td>
</tr>
<tr>
<td>$\mu \cdot \Delta LG_{ij}/LG_{ij}$</td>
<td>Overall effect</td>
</tr>
</tbody>
</table>
property tax increases, the household needs to pay more tax out of pocket, so the changes on utility are negative. The second and the third effect are all related with the changes of the housing price. When the tax rate of the property tax increases, the rents decrease as the property value decreases. The total expenditure on residential consumption will decrease, which increases the household’s utility. This second effect we call it “Price Effect”. The third effect is the Housing wealth Effect. When the property value falls, the household may feel the loss in the wealth, which could lower their total expenditures. The last term is called the “Redistribution Effect”. Since the local government can use the revenue of the property tax to supply the local public goods, then the welfare change would be different on local residents since some would enjoy the benefits while others may not. Given these four potential factors, the sign of the total effect remains unknown.

In the short term, the impact would be smaller. Since the housing consumption choice is fixed, the property value may decline due to the rational expectation of the rents. If the property value is unchanged in the medium term, then the utility is also the same.

\[
\begin{align*}
  u_{ij} &= \theta \cdot \ln x_{ij} + (1 - \theta) \cdot \ln \left[ e_i - (r + \tau_j) \cdot P_j \cdot x_{ij} \right] \\
  &\quad + \mu \cdot \ln LG_{ij} + e_{ij}
\end{align*}
\]

s.t. \( x_{ij} \) is fixed

\[
\Delta V_{ij} = e_{ep} \cdot \frac{\Delta P_j}{P_j} - \theta \cdot \frac{\Delta \tau}{r+\tau} - \theta \cdot \frac{\Delta P_j}{P_j} + \mu \cdot \frac{\Delta LG_{ij}}{LG_{ij}}
\]  

(4.12)

In the long term, we assume that the households can migrate according to the Tiebout Hypothesis. We will see the migration incentive of a household by comparing the potential utility changes in different cities when the migration has not happened. To make it simple, we assume the tax rate is same in all the cities, and we do not consider the Redistribution Effect.

According to Eq. (4.10), the difference of the utility changes under property tax if household \( i \) lives in city \( j \) or city \( k \) is:

\[
\Delta V_{ij} - \Delta V_{ik} = (\theta - e_{ep}) \left[ -\frac{\Delta P_j}{P_j} - \frac{\Delta P_k}{P_k} \right]
\]  

(4.13)

So we can see the difference depends on the differences of the change rates of the housing prices.

Using Eq. (4.8), we can get:

\[
\Delta V_{ij} - \Delta V_{ik} = (\theta - e_{ep}) \left[ \frac{\Delta \tau}{r+\tau} \cdot \left( 1 - \frac{\gamma}{r} \right) \cdot \frac{P_j}{N_j} \cdot P_j \right]
\]

\[
\left( 1 - \frac{\gamma}{r} \right) \cdot \frac{P_k}{N_k} \cdot P_k \right]^{-1}
\]  

(4.14)

From Table 2, we can see how the difference of the utility change between city \( j \) and \( k \) changes with the change of housing wealth effect, housing prices and land area per capita. When \( e_{ep} \) is not large enough, which means that the housing wealth effect is dominated, then a city

with a lower level of \( \frac{P_j}{N_j} \cdot P_j \) becomes more preferable under property tax. And when the housing wealth effect is large enough, the result reverses. The empirical results show that \( \theta \) is usually higher than 20%, while \( e_{ep} \) is usually smaller than 10%. So we can focus mainly on the case \( e_{ep} < \theta \). From Eq. (4.8), a city with a lower level of \( \frac{P_j}{N_j} \cdot P_j \) will have larger decrease of housing price in percentage, which shows it becomes more preferable under property tax. And we notice that housing price has a stronger effect than the land per capita relatively. Though a city becomes more preferable does not mean a household will surely move to the city, because of the preference of the household, the continuity of the preference’s distribution indicates that some migrations may occur from the cities with higher levels of \( \frac{P_j}{N_j} \cdot P_j \) to those with lower levels.

In this paper, besides the decomposition calculation, we use the Stolnits–Jorgenson model to calculate the changes in social welfare by combining both the efficiency and distributional equity criteria.

The indirect utility of household \( k \) can be estimated in the form:

\[
\ln V_k = \ln p' \cdot \alpha_p + 0.5 \cdot \ln p' \cdot B_{pp} \cdot \ln p
\]

\[
-D(p) \cdot \ln \left[ \frac{M_k}{m_0(p, A_k)} \right]
\]  

(4.15)

\( p \) is the price vector of the consumption sectors, \( B_{pp} \) is the demand elasticity matrix, \( D(p) \) is a function of \( p \), \( M_k \) is the total expenditure of household \( k \), \( A_k \) is the vector of demographic variables and \( m_0(p, A_k) \) is the equivalent scale of household \( k \) which is a function of prices and demographic variables. Because we are now considering the utility of a household, we have to rule out the influence of the household’s size. The equivalent scale can normalize all the households to a standard household.

This translog indirect utility function is used widely in measuring a household’s utility. Then we try to measure the social utility.

The social welfare function we use here is:

\[
W = \ln \bar{V} - \gamma'(x) \cdot \left[ \frac{\sum_{k=1}^{K} m_0(p, A_k) \cdot \ln \bar{V} - \ln \bar{V}^{-\rho} \cdot \gamma}{\sum_{k=1}^{K} m_0(p, A_k)} \right]^{-\frac{1}{\rho}}
\]  

(4.16)

\[
\ln \bar{V} = \ln p' \cdot 0.5 \cdot \ln p' \cdot B_{pp} \cdot \ln p - D(p)
\]

\[
\cdot \frac{\sum_{k=1}^{K} m_0(p, A_k) \cdot \ln \left[ \frac{M_k}{m_0(p, A_k)} \right]}{\sum_{k=1}^{K} m_0(p, A_k)}
\]  

(4.17)

\( \gamma'(x) \) is a function with respect to the allocation. This social welfare considers both efficiency and equality. The first term is the average utility each household can get if the

---

**Table 2**

The difference of the utility change between city \( j \) and \( k \).

<table>
<thead>
<tr>
<th>( \Delta V_{ij} - \Delta V_{ik} )</th>
<th>( e_{ep} &lt; \theta )</th>
<th>( e_{ep} &gt; \theta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{\Delta \tau}{r+\tau} )</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>( \frac{\Delta P_j}{P_j} )</td>
<td>−</td>
<td>+</td>
</tr>
</tbody>
</table>

---
expenditures are equally distributed among the households according to their equivalent scales, which represents the concern to efficiency. The second term is the loss from the inequality. \( \rho \) is from \(-1\) to \(-\infty\), representing the relative importance of equality in the social welfare. \( \rho \) is called the degree of aversion of inequality. When \( \rho = -1 \), the greatest possible weight to the equity consideration is given.

5. Data and microsimulation

5.1. Data

The data we use to calculate the impact of property tax is from the China Family Panel Survey (CFPS)\(^1\) in 2010. The data set contains 6827 urban households from 25 provinces in China. This data set is uniquely constructed to be nearly national representative sample, only some remote areas are not included in the sample such as Xinjiang, Tibet, Qinghai, Inner Mongolia, Ningxia and Hainan; the remaining sampling 25 provinces counts for about 94.5% of total population in China. The CFPS was conducted multi-stage, and then in each stage implicit stratification was employed. Appropriate sampling weights have been constructed to adjust for both sampling design and survey non-responses. The detail sampling and weight construction was discussed in Xie and Lu (2015).

The reason why we choose the data in 2010 is to rule out the possible influence of the policy experiment of the property tax in Shanghai and Chongqing starting in 2011. The data source has all the housing characteristics, household income and expenditure, demographics information we need to calculate the social welfare as well as the impact of property tax.

In the survey, the useful demographic include: how many people are in the household, how many children are at school, the ages of the members, the genders of the members, the occupations of the members and so on. With the demographic variables, we can calculate the equivalent scale of each household.

To calculate the household’s indirect utility, the total expenditure of the household is required to compute. The owner occupied housing rent is an important composition of the total expenditure. However, it is usually hard to obtain such information. In the survey, the households were asked at what price they are willing to rent their houses out. We use these values to infer as their own occupied rental price. In our data, there are 169 households who either do not report their expenditures or report unreasonable values (less than $160 a year), 49 households who either do not report their own occupied residential rents or report unreasonable values (less than $100 a year). We eliminate these missing or mistake samples and 6609 samples are left as effective samples.

In the data, we can also get some information about the households’ housing characteristics and ownership condition. For instance, the households were asked whether they own the houses they are living in, how large are their houses, how much is the house valued in the market. They were also asked whether they have other houses besides the one they are living in. If the answer is yes, then they were asked again the same question about the second house, what is the current market value, total areas and etc. The summary statistics of key variables used in our following simulation is given in Table 3.

In our data, there are 25 provinces, which were grouped into 7 regions.\(^2\) The reason we group the data into 7 regions is that there are just less than 300 samples in one province on average, which is not large enough. The regions are divided by economic and geographic conditions. We regard Shanghai as an independent region rather than putting it in Eastern Coastal areas, because Shanghai has more than 1000 samples (15.6%) and it does have some differences with the other coastal provinces.

All the parameters (Table 4) in the translog form indirect utility function are estimated in our previous paper by Cao et al. (2015) using the China Urban Household Survey Data from 1992–2009.

There are three important matrix of the parameters in the simulation, \( Ap \), \( Bap \) and \( Bpp \). \( Ap \) is a constant vector in the simulation which satisfies \( f(Ap) = -1 \). \( Bap \) is a matrix with 11 demographic dummy variables, with which we can

\(^1\) CFPS data is funded by 985 Program of Peking University and carried out by the Institute of Social Science Survey of Peking University.

\(^2\) Northeast China: Liaoning, Jilin, Heilongjiang; Centre China: Shanxi, Henan, Hubei, Hunan, Anhui, Jiangxi; Southwest China: Sichuan, Chongqing, Guangxi, Guizhou, Yunnan; Northwest China: Shaanxi, Gansu; Coastal Areas: Shandong, Jiangsu, Zhejiang, Fujian, Guangdong; North China: Beijing, Tianjin, Hebei; Shanghai: Shanghai.
get the equivalent scale $m_0(p, A_c)$. Bap shows how the consumption behavior changes according to the demographic variables. The demographic variables we choose here includes characters of the head of the household-age, gender, occupation and education; whether has aged person in the household; size of the household and location of the household. Bap satisfies $i^*Bap = 0$. Bpp is the price elasticity matrix, which satisfies $Bpp^i = Bpp$ and $i^*Bpp^i = 0$.

### 5.2. Microsimulation: the impact of property tax reform in China

According to the discussions on the property tax reform, we conduct a microsimulation to examine the potential impacts of property tax reform. Our proposal concentrated on most discussed proposals discussed recently (Table 5).

If a household with $N$ members have $K$ houses, whose areas and values are $M_1, M_2, \ldots, M_K$ and $V_1, V_2, \ldots, V_K$. Then the payment of property tax is:

$$T = \tau \left( \sum_{i=1}^{K} V_i + \frac{V_2}{M_2} \cdot (M_2 - \max\{0, Cover - N - M_1\}) \right),$$

$$\tau = 0.01, \ \text{Cover} = 80 \quad (5.1)$$

In this base case, because the first house owned by the household is free of charge, naturally, quite a lot of the households do not need to pay the tax.

As we can see from Fig. 1, in most provinces, less than 10% of the households are involved in the property tax. In Heilongjiang and Jilin, there are less than 3% households needing to pay the property tax, while in coastal provinces, more than 9% households are involved. The households are richer in the coastal provinces and they will own more houses in average. There are more households involved in the property tax if more households in the province tend to own more than one houses.

Another concern about the property tax is whether the tax is progressive or regressive. Here, we use Suits Index to compute and compare.

Suits Index is similar to the Gini Index, which is used to show the distribution of tax burden. Like Gini Index, all the households are sorted by income per capita from poorest to richest. The accumulated percent income $y$ is measured on the horizontal axis, while the accumulated percent tax burden for a tax policy $x T_a(y)$ is measured on the vertical axis. Then Suits Index $S_x$ is calculated by the area under the Lorenz curve:

$$S_x = 1 - 2 \int_0^1 T_a(y) dy \quad (5.2)$$

If the Suits Index is positive, it means the richer surfer more tax burden, so the tax is progressive. Oppositely, if the Suits Index is negative, it means the richer surfer less tax burden, so the tax is regressive. From Fig. 2, we can see the result varies substantially across the country. It means that property tax may have different distributional impacts in different regions (Fig. 3).

From the distribution, the richest 20% households suffer from the most of the tax burden, and the richer households suffer with more tax burden. It seems the property tax is progressive, because the richer have more houses and tend to pay more tax. However, there are two characteristics in the data need to be taken into consideration. First, the ratio of the tax burden to the expenditure of a household falls as the household becomes richer.
Second, in some regions like the Southwest and Shanghai, the low income households may suffer more tax burden than the middle income households. This may be not so significant in the Southwest or in the North, but in Shanghai we see a significant increase of the tax burden on the second lowest income households. It means some low households may own more houses than the middle income households, which is not consistent with the intuition that richer households are more likely to own more houses. This may due to the effects of Housing Demolition program in China, that is, the old houses in the suburban areas are demolished and the new buildings are constructed instead. Usually, the households involved in the program can get at least two houses for compensation. Because those households live in the suburban areas initially, their incomes are usually below the average. The data really shows the influence of this program. From Fig. 4A, we can see in all the regions, the average number of houses owned per households approximately increases as the income increases. However, when we just consider the households with two or more than two houses in Fig. 4B, the low income households own more houses than the middle income households in average. Housing Demolition program can explain this change, as the middle income households are more likely to buy their second houses while the low income ones are more likely to make it by the program.

Though the program happens almost in all the regions, only in some regions like Shanghai and the Southwest the low income households suffer more than the middle income households. We think this may be related with some characters like the household sizes and the housing areas owned per capita.

From Fig. 5, we see how the housing areas per capita change across different income groups and regions. Shanghai is quite different from the other 6 regions. All the other 5 regions except the North and Shanghai, the housing areas per capita increase as the households become richer, mainly because the less income households own smaller houses and have more household members in average. Given waived area is based on 80 m² per capita, less housing areas per capita makes it easier for the low income households to escape from the tax. Unlike the North, the low income households in Shanghai have about 8 m² more areas per capita, which makes it harder to avoid the involvement of the property tax.

Because of these heterogeneities, the impact of property tax on the social welfare is quite complicated.

Now we try to simulate the impact of property tax on the welfare. As mentioned in the model, the effects can be decomposed into four parts. To make the four effects consistent with the translog welfare function, we regard all the four effects as changes of the expenditures.
For the out of pocket effect, the decrease of the expenditure of the household equals the tax they need to pay, which is determined by how property tax is implemented.

For the price effect, we just consider the short-run effect. It means that we do not consider the change of the residential choice, when the property value decreases, the households spend less on the residence, so that they can spend more on the other goods. In this way, the price effect can be computed by the increase of the expenditure. The price effect is related with how much the property value will fall with property tax. We do not have an exact estimation. In the paper by Bai et al. (2014), they estimated that the property tax experiment lowers the property value in Shanghai for 15%. Due to lack of alternative estimation,
Fig. 4. (A) Number of houses on average for the whole sample. (B) Number of houses in average for the restricted sample.

Fig. 5. Housing areas owned per capita.
we will try different values between 0% and 15% and see how the price effect will be under different circumstances.

For the housing wealth effect, it not only depends on how much the property value will change, but also depends on the marginal propensity to consume with respect to house wealth. In the U.S., many empirical studies have shown that the marginal propensity to consume with respect to house wealth is between 0.05 and 0.07. However, the case is not the same in China. In China, house is more like an investment good rather than a consumption good. Many households in China do not own a house and plan to buy one in the future. If the property value increases, the households may need to save more, therefore the marginal propensity to consume in China may be negative. In this paper, we will try different values between −0.06 and 0.06 and see how the house wealth effect will be under different circumstances.

For redistribution effect, the property tax revenue is assumed to be used in redistribution. The effect means that if the government uses the income from the property tax to provide more local public good, some households may benefit from such programs. The redistribution is very complicated due to the demand characteristics of local public goods. We assume our microsample the distribution of such demand characteristics will not vary in the short and medium term with respect to the property tax policy, so we can use our micro-sample to simulate for this distributional effect of benefits. For example, if the local government uses the income from the property tax to subsidize education, we can regard it as a subsidy to the households with children at school.

Before we decompose the four effects, we now introduce four possible revenue utilization regimes that are discussed the most in China (Table 6).

The first revenue utilization policy is to assume that no subsidy is given on any households. For instance, the revenue can be used to pay back the previously cumulative local government debt. We use this case as the benchmark to compare redistribution policies. Under this policy, the households cannot get any subsidy, so the welfare for any income groups is negative.

The second policy scenario is to assume the property tax is used to enhance local public school system, so the subsidy is implicitly given to the households who have children aged among 7 and 16. In China, the mandatory years of schooling are nine years, and most children enter school at 7. The policy is similar to that in the U.S., where most of the property tax revenue is spent on local public education system.

The third policy scenario is to assume that the property tax revenue can be used to subsidize housing for the poor people. At current standard, only people who do not own any houses or own a house with areas per capita less than 5m² are eligible to apply for the public renting house. In the pilot experiment of property tax in Shanghai, the major part of the property tax revenue has been used to subsidize public renting house program.

The fourth policy scenario is to assume that the property tax is used to both enhance public school system and subsidize housing for the poor people. This policy combines the second and third policies, so eligible households may benefit from both policies. The government can have different choices on spending how much of the tax revenue on these two systems. In the simulation, three sub scenarios have been examined (the public school system will get 40%, 50% and 60% of the total tax revenue respectively; and vice versa for subsidizing housing for the poor at 60%, 50%, and 40%).

In our simulation, we apply the provincial jurisdiction as the border line for each region to redistribute the property tax revenue through these benefit programs. Based on these assumptions, we can use our micro sample to identify how many households are affected by the specific policies. For instance, under the second policy scenario, the difference of the ratio of households with children aged among 7 and 16 is not so large among the regions, in general between 15% and 25%. However, for the third policy, the affected population varies substantially across provinces (Fig. 6).

There are two main factors may affect the eligibility number of households to apply for public renting house. First, if the average income in one province is too low, then the ratio to apply for Public Rental Program is relatively high. There are six provinces can be explained this way: Heilongjiang, Jilin, Shanxi, Shanxi, Gansu and Yunnan. Second, if the housing price is too high; so many households cannot afford a house so more people would choose renting instead, such as Beijing and Shanghai. For the provinces whose average income is higher enough and the housing price is not so high as in Beijing and Shanghai, for example the coastal provinces like Zhejiang and Jiangsu, the ratio is lower significantly. With our micro simulation exercise, we can see how the social welfare will change under various redistribution policies (Table 7).

We can see from Table 7, in the benchmark case of no subsidy at all, the social welfare would not change a lot, because quite a lot of households are not influenced by the property tax. The social welfare decreases under the policy with no subsidy, and the welfare in Shanghai and the coastal area decreases the most. This is because more households own more houses in Beijing and Shanghai, so the tax burden has a negative effect on the social welfare where benefit program does not exist yet. For the other two scenarios, we can see that for both the education subsidy policy and the housing subsidy policy, the social welfare would increase, and the housing subsidy policy always deliver better performance. In general, whether a household has a child aged between 7 and 16 is weakly correlated with the income of the household; while a household with lower income is more likely to own no

<table>
<thead>
<tr>
<th>Table 6</th>
<th>Scenarios of utilization property tax revenues.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>Qualification</td>
</tr>
<tr>
<td>No subsidy</td>
<td>No household can get subsidy</td>
</tr>
<tr>
<td>Education subsidy</td>
<td>Each child aged among 7 and 16 can be subsidized</td>
</tr>
<tr>
<td>Housing subsidy</td>
<td>A household owning no house or owning a house with areas per capita less than 5m²</td>
</tr>
<tr>
<td>Double subsidy</td>
<td>All the households that are involved in education subsidy and housing subsidy policy are qualified</td>
</tr>
</tbody>
</table>

house or own a house with small areas. Intuitively, the education subsidy policy redistribute the revenue among the households without children but not directly target low-income group; while the housing subsidy policy can redistribute the revenue directly to the households with low income. In result, the latter mitigate more inequality than alternative regimes. And we can see that the education subsidy policy has weaker effects in Shanghai and Northeast. It may be due to the correlation between the student numbers of a household and the income of a household (Table 8). Though in all areas it seems that a household with higher income is more likely to have fewer students, the correlation is much weaker in Shanghai and Northeast. The second reason may be relevant to the number of students per household. The student number per household in Shanghai is much lower than other places, and Northeast is next lower among the rest six regions. The lower number of students per household means that less proportion of households are involved in the education subsidy policy, which makes the effect of the policy weaker. The double subsidy policy performs better than the education subsidy policy alone, but still worse than the housing subsidy policy, as expected. Among the three sub scenarios of double subsidy policies, the more tax revenue are spent on the public school system, the less increase on the social welfare.

In all the scenarios, the housing subsidy policy performs better than the education subsidy policy and the double subsidy policy for all the regions. So we just need to focus on the housing subsidy policy.

Now we can decompose the four effects under the property tax policy with housing subsidy.
Besides the benchmark tax rate of 1%, we also tried alternative rates: 0.5% and 1.2%. This range reflects the current discussed upper and lower bound of the property tax rate range. From Table 9, we can see the four effects under the three tax rate scenarios have similar patterns. The changes of the tax rates would not affect the tax base, it will only affect the magnitude levels that property tax would pay, as well as the overall welfare. Compared to price effect and housing wealth effect, out of pocket effect and redistribution effect is much smaller. The reason is that every household is influenced by the price effect and house wealth effect, while only a few are involved in redistribution and payment of property tax. We can see that the effects differ a lot among the regions. The housing wealth effect dominates the other three effects. If the propensity to consume is positive like in the U.S., then property tax may lower the welfare; otherwise, the welfare may increase due to the increase of consumption as there is no need to save so much with the falling of property value. To estimate the propensity to consume in China is very important to compute the impact of property tax on the welfare, which will be involved in our further work.

Now naturally, a question occurs, if China is going to implement the property tax, should all the country-side impose the uniform property tax rate or let the local government decide the rate within its jurisdiction? If so, what is the optimal policy across regions?

As discussed above, price effect and house wealth effect are not influenced by how the property tax is implemented and how the revenue is redistributed. And we use housing subsidy policy to be the redistribution policy.

To address these issues, we compare two alternative policies for local governments to opt in to choose their optimal policy:

1. All the housing areas are taxed, similar to the US case.
2. The first house is free of charge, and there are some areas free of charge for the first two houses, the left areas are taxed, similar to the Shanghai case.

Under the first policies, the increase of tax rate has two different effects. On one hand, as the tax rate increases, all the households need to pay more tax, which will lower the

### Table 8
Statistics about the number of students.

<table>
<thead>
<tr>
<th>Region</th>
<th>Correlation between number of students in a household and income per capita</th>
<th>Number of students per household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>−0.0835</td>
<td>0.1912</td>
</tr>
<tr>
<td>Centre</td>
<td>−0.0997</td>
<td>0.2778</td>
</tr>
<tr>
<td>Southwest</td>
<td>−0.1419</td>
<td>0.3139</td>
</tr>
<tr>
<td>Northwest</td>
<td>−0.1056</td>
<td>0.2725</td>
</tr>
<tr>
<td>Coastal</td>
<td>−0.1039</td>
<td>0.2925</td>
</tr>
<tr>
<td>North</td>
<td>−0.1229</td>
<td>0.2554</td>
</tr>
<tr>
<td>Shanghai</td>
<td>−0.0751</td>
<td>0.1049</td>
</tr>
</tbody>
</table>

### Table 9
A. Decomposition of four effects of property tax with tax rate of 1%.

<table>
<thead>
<tr>
<th>Region</th>
<th>Out of pocket effect</th>
<th>Price effect</th>
<th>Housing wealth effect</th>
<th>Redistribution effect</th>
<th>Whole effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
</tbody>
</table>

(B) Decomposition of four effects of property tax with tax rate of 0.5%.

<table>
<thead>
<tr>
<th>Region</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
</tbody>
</table>

(C) Decomposition of four effects of property tax with tax rate of 1.2%.

<table>
<thead>
<tr>
<th>Region</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>max</td>
<td>mean</td>
<td>max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
<td>(pp = 0)</td>
<td>(pp = 15%, ee = 0)</td>
</tr>
</tbody>
</table>

* pp means the percentage of price falling with respect to property tax.
* ee means the marginal propensity to consume of housing wealth.
* The mean is the average of the values with all possible parameters of pp and ee in the range.
* We use the housing subsidy policy for the redistribution effect.
* This case is based on Yang's result.
welfare; on the other hand, more tax revenues can be redistributed from the rich to the poor, which will increase the welfare.

Under the second policies, both the tax rate and the areas free of charge can change. We first argue that at given areas free of charge, the lower the tax rate is, the lower the welfare will be. Given areas free of charge, the tax base can be determined. And because the first house is free of charge, most of the low income households do not need to pay the tax. Then the first effect we mentioned above that the welfare will decrease since more tax to pay seems much weaker. It’s obvious that the first effect will be dominated by the second effect. The decrease of the tax rate makes less revenue to be redistributed so that it will lower the welfare. But the tax rate is not the higher the better as mentioned, so we choose 1% as a reasonable tax rate for the second policies.

When we consider the change of the areas waived for property tax charges, there are also two different effects. As the areas waived decreases, more low income households will be involved in the tax. The poor needs to pay more tax, which lowers the welfare. On the other hand, more revenue can be redistributed as the areas free of charge decreases, which will increase the welfare.

Now we can use this framework to simulate different policies and compare. Here we focus on some policies that are relatively political feasible (for instance the tax rate should be smaller than 1% to avoid political resistance and big shock to the economy), but still achieve satisfactory results than other policies. Fig. 7 shows how the welfare varies with the change of waived areas in each region. So we can get some rough idea of the optimal waived areas in Shanghai case. Table 10 gives a summary of such admissible policies after comparing their corresponding welfare changes. We can see that these admissible policies are different among the regions and the welfare changes also vary a lot among the regions. In all regions, the Shanghai case policy performs better than the U.S. case policy. So in the further implementation of the property tax, how to set the waived areas is important to consider in the policy design.

### Conclusion

Despite many years of discussion whether or not, and how to impose a property tax reform in China, very little quantitative study has been conducted on the analysis of the impacts of potential property tax reform in China. So we still have little understanding of the effects if China impose the property tax, and what would be the incidence on the households, that is, who will benefit and who will get worse off due to these reforms. Since China’s real estate market are so different across the whole nation, the appropriate policy is obviously would be quite different across provinces.

To shed some lights on these questions, in this paper we used the China Family Panel Survey (CFPS) data to conduct a microsimulation model to examine possible impacts and incidences of alternative property tax regimes in China. We use the cross-sectional information in the micro-data to decompose and simulate the potential effects of property tax policies, and found the impacts differ quite significantly across regions and across households. Using the Slesnick-Jorgenson to combine both criteria of efficiency and equity, we simulated for various property tax scenarios for each provinces in our sample, our results

---

**Table 10**

<table>
<thead>
<tr>
<th>Region</th>
<th>U.S. case</th>
<th>Shanghai case*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tax rate with no waived areas (%)</td>
<td>Welfare change (%)</td>
</tr>
<tr>
<td>Northeast</td>
<td>0.4</td>
<td>0.058</td>
</tr>
<tr>
<td>Center</td>
<td>0.2</td>
<td>0.099</td>
</tr>
<tr>
<td>Southwest</td>
<td>0.1</td>
<td>0.011</td>
</tr>
<tr>
<td>Northwest</td>
<td>0.5</td>
<td>0.025</td>
</tr>
<tr>
<td>Coastal</td>
<td>0.1</td>
<td>0.063</td>
</tr>
<tr>
<td>North</td>
<td>0.2</td>
<td>0.061</td>
</tr>
<tr>
<td>Shanghai</td>
<td>0.3</td>
<td>0.073</td>
</tr>
</tbody>
</table>

* In Shanghai Case, the tax rate is set to be 1%.

b The suggested policy.

---

**Fig. 7.** The welfare change with waived areas for different regions.
suggest that property tax, as a local tax, would achieve better performance if the policy design is catered to match the unique distribution of the housing ownership, income group and consumption distributions in each area.

With the microsimulation focused on the incidence of property tax reform, we found the tax is more likely to be progressive in many cases. Redistributing the property tax revenue would somewhat mitigate the regressivity, and the direct subsidy on the poor’s public housing program usually achieve better performance in terms of social welfare.

Our study has provided some crude estimates on the potential impacts of property tax reform in China for the short-run and medium run. It seems that the property tax in Shanghai case performs better than the U.S. case. In the future property tax reform, it is very likely the first house owned by a household or certain floor area would be waived from taxation. Considering most households live in an apartment typically between 80 and 120 square meters, for a typical household with three household members, a waived area of 30–40 per capita would lead to the outcome that most of the households in China do not need to suffer the tax burden. If the households have two or more houses or apartments, then the waived area would matter quite a lot. In our experiments and simulations, we found out to maximize social welfare, it is important to set different waived area per capita at local level considering huge heterogeneity across whole China. In addition, the revenues from the property tax should be used to subsidize housing for the poor people. Similarly, the optimal tax rates are also supposed to be different in different regions, less than 1% seems to be more acceptable. Many potential effects of the property tax remain unknown, nevertheless it is even harder to implement the policy in practice. To make it easier to be accepted, at the beginning, property tax can be imposed on the property owners having more than two or three houses or apartments at lower rate, then gradually expand the coverage and raise the tax rate, along with better local public good provision.

In the future when the panel data or repeated cross-section data are available with both household income distribution, housing information, housing price changes as well as detail housing characteristics, we can extend our static model and cross-sectional simulation to a dynamic microsimulation, then we may also assess the longer term impacts of the property tax policy on housing market, as well as household behaviors and social welfare. Finally, in our simple model here we did not allow for the capital flow and labor migration in our model. According to literature, property tax differences across regions would potentially lead to factors move around, so this would lead to a future study when more detail capital flow and labor migration information is available from the previous empirical evidence, then we can improve current studies to better understand how housing prices and property tax changes lead to these changes.

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