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The effectiveness of property tax pilot on the price of residential housing in Shanghai

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Summary

After 1998, the real estate market in China experienced many rounds of policy regulations in the following years. However, the effect on the price of residential housing is not obvious. Hence, Shanghai as a pilot introduced property tax on the residential houses. This research focuses on the effectiveness of property tax pilot on the residential housing in Shanghai. The main goal of this research is to analyse the influence of property tax pilots to see whether it can restrain the growing price of residential housing or just a value capture instrument to obtain the revenue. In this study, a combination of quantitative and qualitative research is conducted. In detail, a hedonic model and in-depth interviews are applied. It is found that the property has negative effect the housing price by decreasing the demand and increasing the supply. Besides, the property tax can be used as effective long-term tools for restrain the growing housing price. And it is a stable income to provide social housing to low-income people. At last, some advices are given. The study suggested that at least 5 years data or more are needed. And some important factors like population, employment and consumption should be included in the model and interviews. In addition, more samples are necessary for the in-depth interview.

Keywords

Property Tax, Housing Price, Effect, Hedonic Model, Policy

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Foreword

In recent years, the Chinese government has promulgated a series of policies to curb the excessive growth of house prices and optimize the financial system. The implementation of the property tax pilot in Shanghai is the most concerned one. However, most of the scholars in China are limited within descriptive statistics to analyse the policy. At international level, there are a number of researches about the impact of a public policy by using Hedonic model. Therefore, this research focuses on using Hedonic explore the effectiveness of Shanghai's property tax pilot. In addition, this study could provide suggestions and evidences to the further development of the property tax.

Abbreviations

PI	Price index of residential housing
PT	Property tax revenue
INC	Income
BC	Building Cost
CCI	Consumer Confidence Index
CH	Completed housing
INV	Investment
GDP	Gross domestic product
IR	Interest Rate
INF	Inflation
MR	Mortgage rate
IE	Imports and exports
OECD	Organization for Economic Co-operation and Development

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Chapter 1: Introduction

1.1 Background

1.1.1 Regulations on the real estate market between 1998 and 2010

After the implementation of reforms regarding the monetisation of housing distribution in 1998, the real estate industry in China entered a new stage of rapid development. Over the following years the industry then experienced four rounds of policy regulation.

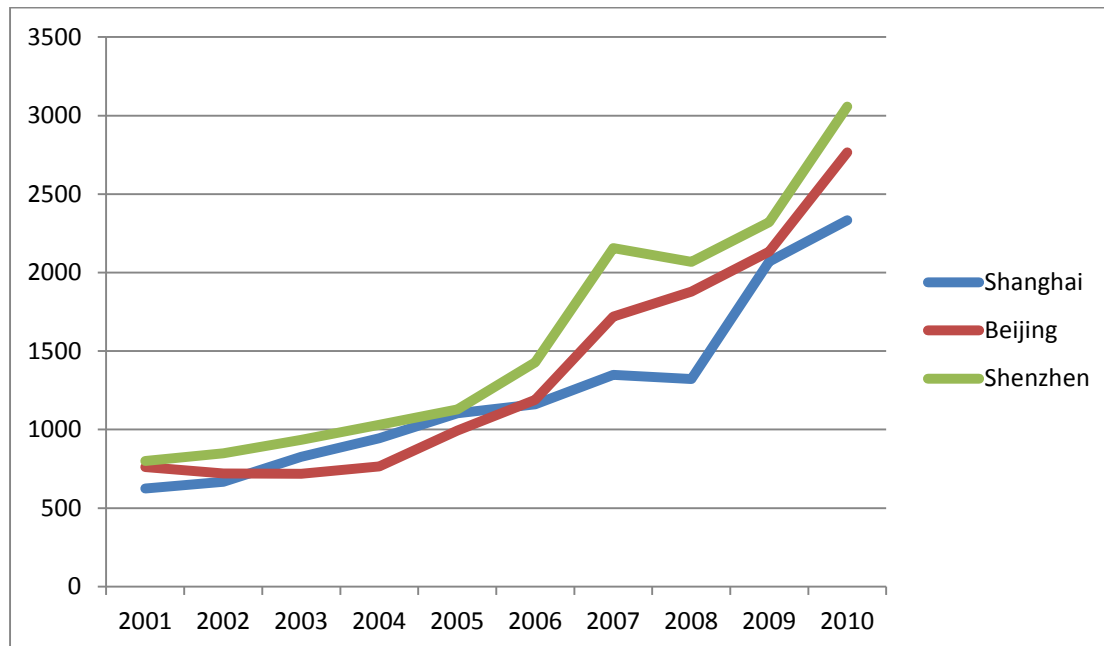
As seen in Table 1, the control policies of the real estate market can be divided into four periods from 1998 to 2010(Chen, 2011, p49).

Table 1 Control policies of real estate market (1998-2010)

Periods (year)	Situation	Policy
1998-2003	After the Asian financial crisis in 1997, China's economy began to experience deflation; the real estate market also entered low ebb.	The central government stopped the welfare housing distribution system across the whole country and implemented the monetisation of the housing distribution system.
2003-2005	Real estate investment within China grew quickly; the price of land and housing increased sharply.	The government increased the mortgage down-payment ratio (the mortgage down-payment ratio for a second house increased to 40%) and implemented a differentiated mortgage rate, tax and housing structure.
2005-2007	House prices continued to rise rapidly, particularly in many cities, such as Beijing, Shanghai and Shenzhen.	The central government put in place many measures to curb the rapid rise of housing prices, including establishing response-on-demand accountability for housing guarantees and housing price stability.
2008-2010	After the effects of the new regulations began to show, policy loosened again, eventually resulting in the progress made by previous efforts being lost, and a swift downturn occurring in China's real estate market.	The government began to subsidise homeowners' living costs, curb speculative housing investment; strengthen market supervision, and limit loans and the second house.

Although the government has formulated many real estate regulation policies, the effect on the price of residential housing is not obvious (see Figure 1). Some experts have suggested that the government should impose property tax focused on individual residential housing, arguing that it is a good way to reduce the housing price(Deng and Gong, 2008, p57).

Figure 1 The price of residential housing in Shanghai, Beijing and Shenzhen 2001-2010, unit: USD/m²



Source: China statistical yearbook 2001-2010 (National Bureau of Statistic of China, 2014)

1.1.2 Introducing processes of Shanghai's property tax pilot

In 2003, China proposed reforming the urban maintenance and construction tax¹. As well as imposing the unified property tax on real estate for the first time, the proposal put forward the idea of integrating the real estate tax system and improving the structure of property taxation. On May 25, 2009, relevant documents issued by the central government specifically proposed “deepening real estate tax reform and researching the imposition of property tax” (Song, 2014, p84).

In September 2010, representatives of the Ministry of Finance said that adding property tax to individual housing would improve both the residents’ income and the local taxation system, and would aid the rational consumption of individual housing. Additionally, they added, it would promote intensive land use, bringing benefits for later generations. So with the aim of ensuring the sound development of real estate, the property tax was put on the agenda (Huang, 2014, p106).

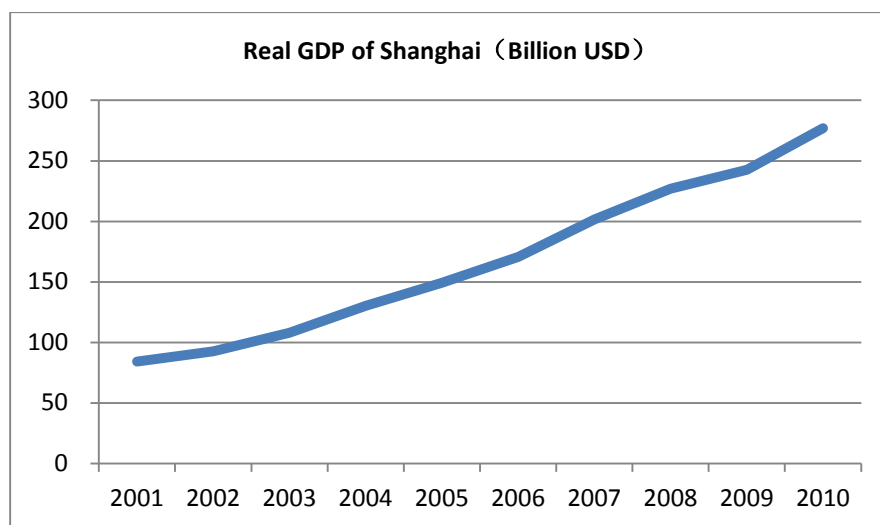
On January 28, 2011, the pilot city, Shanghai, implemented the property tax reform pilot plan issued by the State Council, and China formally unveiled the imposition of property tax on individual housing. This reflected the decision of the Chinese government to use taxation to adjust the market (Huang, 2014, p106).

¹ A tax placed on the revenue of companies and individuals in China.

1.1.3 The economy and real estate market of Shanghai

Shanghai is located in the eastern part of China, covers an area of 5800 square kilometres and has a population of about 250 million. It is China's biggest city and one of the world's major metropolises. Moreover, Shanghai is one of the municipalities directly under the control of the central government, and is the economic centre of the People's Republic of China. As we can see in Figure 2, between 2001 and 2010, Shanghai underwent a very swift development, providing a stable economic environment for the property tax pilot to be tested in.

Figure 2 The real GDP of Shanghai (2001-2010)



Source: Shanghai statistical yearbook 2001-2010 (National Bureau of Statistic of China, 2014)

1.2 Problem Statement

The government's regulation tools for the real estate industry can generally be divided into three classes: land, capital and tax. Over the past ten years, these tools were used to a new extreme and new regulations were introduced frequently. However, the effect was unsatisfactory. The management policies regarding house purchasing, such as limitations on pricing and purchasing, were flawed as they did not effectively separate genuine buyers from housing scalpers.

Shanghai announced that the property tax would be collected next day on January 27, 2011. The details of the property tax pilot can be seen in Table 2.

Table 2 The detailed rules of the property tax pilot in Shanghai (Jia, 2011, p5)

Items	Rules
Scope of the pilot	Administrative urban area of Shanghai

Tax rate	Tax rate of 0.6%
Shanghai citizens²	The second (or above) residential house of a family should pay the tax
Non-Shanghai citizens	Every residential house newly purchased by a non-Shanghai family should pay the tax
Tax base	The 70% market price of taxable housing
Tax-exempt area	When the residential area is less than 60m ² per person in a Shanghai family (rule excludes non-Shanghai citizens).
Use of revenue	The revenue of such tax will be used for construction of social housing and related expenditure by local government.

Generally, the housing price is determined by the supply-demand relationship. Consequently, the leading policy, which included a housing guarantee system and took into account the central or local property-power relationships, was intended to play a significant role in the establishment of property prices. The influence of property taxes on housing prices mainly depends on the taxation rate and tax base. However, some experts argued (Meng, 2011, p47) that the property tax pilot in Shanghai would not help the government to control speculation and would ultimately have little effect on the price of residential housing. This research examines the effectiveness of the property tax pilot on the residential housing in Shanghai.

1.3 Research Objectives

The main goal of this research is to analyse the influence of the property tax pilot to see whether it can restrain the growing price of residential housing or just a way for the government to increase its revenue. In addition, summarising the results of the property tax reform pilot can lay a foundation for the development of property tax across the country. Therefore, the detailed objectives of this research are as follows:

- To study what factors could affect the price of residential housing.
- To analyse how the property tax pilot affect the price of residential housing.
- To identify the advantages and disadvantages of the property tax pilot in Shanghai.

1.4 Research Question

To what extent did the property tax pilot in Shanghai affect the price of residential housing between 2011 and 2014?

Sub-questions:

1. How did the property tax pilot in Shanghai affect the housing prices?
2. Could the property tax pilot in Shanghai achieve its goal of restraining the growing residential housing prices ?
3. How was the revenue of the property tax used?

² Shanghai citizens are those who are registered to a Shanghai urban household under China's Hukou system.

1.5 Significance of the Study

The housing problem is a major issue that affects many families. Property tax, it is argued, may improve the taxation system of the real estate market and play an important role in stabilising prices, adjusting income distribution and raising local fiscal revenue. Studying the Chinese government's property tax pilot in Shanghai will help both governmental and academic agencies find the problems in the Chinese real-estate market as well as deficiencies in the existing land and housing taxation system. Moreover, analysing the results of the pilot test will help make further improvements to the real estate industry and provide a reference for the utilisation of property tax nationwide.

There has been a great deal of research about property taxation in China, but most lacks an empirical basis. This paper will use a large amount of detailed data about the property tax pilot in Shanghai to explore the long-term and short-term effects of the pilot over the last four years.

The study focuses on both supply and demand within the real estate market and will help people understand the elements of the supply-demand relationship that could be affected by the pilot policy.

1.6 Scope and Limitation

This study mainly focuses on the effect of the property tax pilot used in the whole Shanghai urban area; consequently, it cannot draw conclusions about specific districts in Shanghai.

As the pilot began in January 2011, there are only four years data that can be obtained, which makes the choice of methodology more difficult.

Every city is affected by the macro-economic conditions of its country. Even though the economy of China is developing stably, there are problems with controlling the effect of national level development in this research.

As a large city, Shanghai is a very complicated system to analyse and many variables should be considered. However, there is not enough time to fully establish all relevant factors.

Chapter 2: Literature Review

2.1 Land Value Capture

2.1.1 The concept of land value capture

Land is one of the most important resources for all cities. No matter what a country's land system may be, its landowners always hope to increase the value of their land. In some cases they can do this by increasing investment and expanding production that will would make the land value grow (Fainstein, 2012, p21). Nevertheless, more often than not the land value increases due to the actions of the wider public. Many economists and political scientists, such as David Ricardo and John Rawls, hold the view that land is not just a private possession but also a kind of collective possession of all a city's citizens. The city should have right to take advantage of the profit from land value in some certain conditions (Fainstein, 2012, p22).

For this reason many governments have created instruments to use the money generated by increases in land value for public purposes, and these will be outlined below, beginning with changes in public regulations.

For example, after the revised master plan and new zoning policy, some farmlands were changed into commercial areas, increasing their value; also the construction of infrastructure such as roads, schools and airports has raised the value of land; and the development of the city's economy and an increase in its population has also pushed up the land value (Hong and Ingram, 2012, p4). To adapt to different conditions, the Chinese government introduced many kinds of policy instrument.

2.1.2 The types of land value capture instruments

There are various kinds of land value capture instruments; the following table presents four types that are being used widely and will be considered in this research.

Table 3 Main land value capture instruments

Instrument	Content	Country
Property tax	Many countries implement property taxes. Generally speaking, the property tax should be base on the exact market value of the taxable property and be paid by the landowners in accordance with the time and rate(Walters, 2012, p187).	Australia, Canada, Chile, Denmark, Greece, India, Ireland, Netherlands, United Kingdom and United States.
Land leasing	Land leasing involves the government being the landowner and transferred some part of its land rights to the lessee (usage rights, development rights or benefit rights) for a period of time. In return, the lessee should pay an annual rent or premium to the government (Hong and Bourassa, 2004, p5).	China, Netherlands, Finland, Sweden and Israel.
Land	Land readjustment is a process in which	Japan, South Korea, Turkey,

readjustment	the public sector cooperates with private landowners (sometimes including the land users) to change boundaries and make more land available for the construction of infrastructure (Li and Lin, 2007, p83).	Indonesia, India and Iran.
Development fee	This is a kind of fee that local governments charge developers in order to cover the impact of new projects on existing infrastructure or the expenditure of building more infrastructure (Walters, 2012, p188).	United States

In conclusion, the instruments of land value capture are a way to capitalise on increases in land value created by the public sectors by charging the developers who enjoy the benefits. The specific method used to capture the value depends on the land system used in a country. For example, in China there are no real landowners. All the urban land belongs to the central government. Citizens and companies can only use the land by “leasing”³ it out. Consequently land readjustment is not available as it is a kind of cooperation between landowners. Land users in China do not have the right to change the use of land.

2.1.3 Land value capture in China

Many researchers describe land leasing as the main instrument for capturing value in China. In addition, Anderson argued that the leasing system in China is completely different from those of Western countries for three reasons. First, the government of China is the only landowner of all urban land. Second, developers in China must pay a lump sum for the leasehold, and local government relies heavily on this for financing. Third, during leasehold period, there is no mechanism to renew or renegotiate the time or price until the lease ends (Anderson, 2012, p123).

However, even though the land-leasing system in China is very effective at capturing land value, there are other instruments that do the same work: land value-added tax, urban construction fees and property tax are all included in this research.

This has left some land users wondering why they should pay other kinds of taxes or fees after the initial lump sum is paid on the property. It appears to them that the government has captured the land value twice. However, Hong believes that the government of China considers land that has been leased out to be the same as private property (Hong, 2005, p5).

According to this line of thinking, if the leased property is a form of private property rather than public land, other taxes and fees ought to be paid. On the other hand, Anderson asserts that due to an inefficient property market and fast-increasing land value, the premium paid for a long-term lease cannot reflect the real value of the land. In order to fully capture increases in land value caused by external factors such as the effect of the wider public, the government of China should have the right to impose more instruments of land value capture (Anderson, 2012, p124).

³ In China, the government describes "land leasing" as "land transferring".

Based on the above opinions, implementing additional instruments of land value capture would not meet problems regarding rationality and necessity. Nevertheless, it is necessary to formulate relevant laws to confirm their legitimacy.

2.2 Property tax

As a system of land value capture, property tax is implemented extensively in many developing and developed countries. Studies on OECD countries (Bird and Slack, 2004, p20) have shown that property tax is a suitable way for local governments to capture the additional value created by so-called ‘public goods’ (Kitchen, 2012, p12). These studies also suggest that property tax satisfies the requirements necessary to be considered an excellent local tax (Jia, 2011, p7).

In order to understand the similarities and differences between the Shanghai property tax pilot and existing property taxes in other countries, it is necessary to comment on the three elements of property tax: tax base, assessment and tax rate.

Property tax base

When it comes to property tax base, there is no international standard for countries to use. According to the practices of many countries, the property tax base can be divided into three types: land and improvement, land and building, and only building, respectively (Kitchen, 2012, p13). The property tax base of the Shanghai pilot falls into the third category.

Bahl and Martinez-Vazquez argued that the base is one of advantages of property tax. Since the land or building is not taxable by the central government, all the captured value could be put into local finance (Bahl and Martinez-Vazquez, 2007, p8). However, they do make one incorrect assertion: that property in China is taxed by the central government. In fact, except for the urban maintenance and construction tax, all land-related taxes are levied by local governments.

Some researchers have focused on changes to the property tax base, using models to explain the responses from various cities and counties in Florida. Their results show that it is more difficult for cities to make appropriate responses to changes in the property tax base than the smaller counties. Some cities even reduced public spending on safety and the environment (Ihlanfeldt, 2011, p30). If property tax on residential housing were implemented across the whole of China, Shanghai, as a very big pilot city, might not give a clear indication of how the property tax base should be adjusted for smaller cities. This situation should be considered carefully.

Ultimately, the discussion about property tax base is about whether the base should be broad or narrow. Cornia asserted that a broader the tax base is better, arguing that a broad base always comes with low rate, resulting in fairer and more stable revenue (Cornia, 2012, p212).

The Shanghai property tax pilot only focuses on newly purchased residential houses, which suggests a tax base that is not broad. However, since Shanghai does not yet have a mature property registration system, in terms of technology, focusing taxation on newly purchased housing is a relatively easy choice for the government to implement, as it is easy to register newly purchased housing.

Property tax assessment

After deciding on the property tax base, the next step is to assess the property. Kitchen identified three main methods of assessment used in many countries. The details are in the following table (Kitchen, 2012, p124).

Table 4 Main assessment basis of property tax

Basis assessment	Countries
Market value	Australia, Canada, Germany, Japan, UK, Latvia, Argentina, Colombia, Mexico, Indonesia, Philippines, Thailand, China, Kenya, South Africa, Tanzania
Rental value	Australia, UK, India, Thailand, Guinea, Tunisia
Area	Hungary, Poland, Russia, Ukraine, Chile, Kenya, Tunisia

According to this information, most countries use market value as their basis of assessment. In other words, they prefer the capitalist method to capture land value. It should also be mentioned that some countries, such as Australia, use more than one type of assessment basis as they evaluate different properties using different approaches. Many methods are used to assess the market value of property. Zhang has noted that, in recent years, the Single Appraisal has caused some problems such as tax revenue loss, an unfair tax burden and inconvenience when wanting to re-evaluate.

What is worse, it is not conducive to obtaining the correct evaluation of local financial resources. For these reasons, some countries have adopted the Mass Appraisal, which factors in the original market method, income method and cost method, as well as combining statistical technology, computer application technology and modern information technology to create a more detailed appraisal. Mass Appraisal has gradually replaced the Single Appraisal of property tax and became the mainstream property tax assessment method (Zhang, 2007, p17).

In the case of Shanghai's property tax pilot, local government has temporarily replaced the market value with the sale price. There is no clear statement about subsequent methods of evaluating the market value. This defect needs to be solved in future. The tax department in Shanghai should publish the assessment rules of the housing market value. Moreover, a system should be build to update the market value periodically.

Property tax rates

In brief, the amount of tax to be paid is determined as shown in the following formula.

$$T=B*R$$

(T= the amount of tax, B= the tax base, R= the tax rate)

The final amount of tax depends on changes in the tax base and the tax rate. There are two kinds of tax rates. One is a flat rate that stays the same regardless of how large the property value is. The other is a progressive rate in which the rate might increase with the growth of the property's value, similar to the income tax in many countries (Zorn, 2012, p133).

The pilot in Shanghai set a flat rate of 0.6% regardless of whether the property is luxury housing. This may seem like a very low rate compared to income tax, but in a study on property tax in developing countries, Bahl and Vazquez explained that through the balance between governments and taxpayers, the property tax rates are usually not too high. Generally, rates are in the range of 0.5% to 1% in countries that assess the market value (Zorn, 2012, p134). With this in mind, the property tax rate in the Shanghai pilot is reasonable.

2.3 The effectiveness of property tax

Although China's property tax is still in the pilot phase, many other countries have implemented property taxes for years. Consequently many studies have been performed on them, and there is a great deal of literature on the subject.

Theoretical studies

Hu pointed out three main views on the effect of property tax on housing prices (Hu, 2010, p8).

The **traditional view** divided property tax into two parts – tax on the land and tax on the building – and conducts a partial equilibrium analysis. In terms of tax on the building, from a long-term point of view, the market prices of the housing reflect the required capital, and the supply is completely elastic. Thus the tax burden can be passed on to the consumer. Studies also suggest that the capital within a country can flow freely, the tax burden is borne by the user of producing factors. As the result, the house prices rise. Simply put, the traditional view is that property tax is a kind of circulation tax that pushes housing prices up.

The **benefit view** brought a new perspective to the study of public goods. It established the theoretical model of local public expenditure. In this model, it is assumed that consumers can flow freely between different communities. Based on the measurement of services and taxes, potential residents and businesses will choose the most satisfactory community for them. In the benefit view, property tax is a payment for a public product and service; taxpayers use the property tax to buy public services. As a result of this, property tax would not distort the housing price.

The **new view** conducted a general equilibrium analysis of property tax. The basic assumption is that capital can flow freely, and the elasticity of the supply of capital is zero. Hence, wherever the capital flows to, the capital owner needs to pay property tax. The property tax is imposed in full onto the owners of the capital. The difference in the rate setting of each area will have an impact on the allocation of capital. If a regional tax rate is higher than the national average level, capital owners will try to pay less tax by transferring the capital to low-tax areas. The introduction of new or higher property taxes will cause a decline in housing prices.

Empirical studies

Boelhouwer has made a study of housing prices in various countries to analyse how tax policy can control the real estate market. He found that the tax policies in few countries failed to achieve the expected goals, such as those in France, Belgium and the Netherlands. He also studied the changes in housing prices over the four years before and after the tax reforms. Many countries, such as Denmark, Sweden, USA and Germany, achieved their expected goals (Boelhouwer, 2004, p420).

Seth Payton conducted an empirical study on 9346 residential houses sold in Marion County, Indiana State, USA, in 1999. The results indicated that the actual property tax was significantly and negatively related to housing prices. It was also the major factor influencing housing prices (Payton, 2004, p70).

Kuang, Zhu and Liu studied OECD countries and put forward the proposal that the property tax was not only of great significance to the housing market's macro-control, but also had important implications for therefore of the taxation systems of local government. Through theoretical and empirical analysis, the paper reached a number of conclusions. Firstly, the theoretical model showed that property taxes and rates were negatively correlated, which

indicated that the property tax levy restrained price increases. At the same time, the empirical studies found that the real estate tax had a significant negative effect on housing prices, which gave support to the theoretical model.

Secondly, the descriptive analysis showed that the property tax was the main source of fiscal revenue for the local government. Therefore, the property tax was the main tax for the local government. This is important to China, as when Chinese urbanisation is completed in the future, land transfer payments will be no longer a major source of fiscal revenue for local governments, so the effect of property taxation will become more and more important.

Additionally, empirical studies found that the levying of property taxes will reduce the price of property. Nevertheless, 23 OECD countries have witnessed only 2.61% growth in the property tax rate in the past 30 years, thus local governments are unlikely to significantly increase their property tax rates (Kuang, Zhu, et al., 2012, p127-128).

2.4 Studies about China's property tax

After reviewing the general scope of property tax, this part will focus on the studies about property tax in China. For China, the property tax is a new member in the tax system. Few researchers from other countries have studied it deeply thus most literatures in this part are written by Chinese authors. More specific, the literatures on this topic are mainly concentrated in the discussion about property tax reform and the Comments on the property tax pilots.

Property tax reform

As Yang noted in 2011, Shanghai's property tax is an important source of financial revenue for the local government. Based on this, it seems fair to say that the Chinese government should take progressive measures to put the property tax into effect nationwide, replacing lump sum payments for land leasing. Instead of handing in the 70-year premium at one time, property owners should pay a property tax that changes with the market value every year. This will be highly beneficial to China. Besides enlarging the scope of property tax, the government should also further define the subject of taxation and regulate the use of property tax. The government below the county level should be involved in collecting property tax so as to meet the financial needs of local regions (Yang, 2011, p134).

With regard to the rate of property tax, some scholars such as Deng and Gong believe that the local government should be given greater autonomy. They say that the rate of property tax should fall within the rational scope set by the central government. The local economic level, as well as the collection and management of local finance, should be also taken into consideration. In summary, the rate of property tax should be based on the actual conditions of the local region (Deng and Gong, 2008, p56).

Zeng points out that the improvement of the property tax system should start by unifying the taxation basis and adjusting the current tax rate. The base of the property tax should be built around the current value of the house. The assessment should be conducted by an agency devoted to legal property.

As well as strictly following the market rules, the assessment will last for three to five years, a period determined by the economic cycles of the various provinces. During the course of promoting property tax around the whole country, the tax rate should be adjusted accordingly and a progressive tax should be adopted. On the basis of ensuring tax-exemption for lose

living in low-cost, normal living areas, the extra tax should be paid with the addition of living area held by the individual (Zeng, 2011, p180).

Li J. and Li Z. think that the most important factors in dramatic increases in housing prices are not local governments selling land at high prices, real-estate developers raising prices or financial institutions making loans. They argue that the most important reason is the demand for speculation and investment, which is not easy to predict. A higher tax rate or progressive tax should be adopted in order to raise the carrying cost of the property owners. The progressive tax can not only constrain the speculative demand for real estate but also avoid dramatic changes in housing price. This means it can function as a stabiliser for the real estate market (Li and Li, 2010, 48).

Some scholars, including Qiu and Tu believe that a proportional tax can be calculated simpler, faster and easier than a progressive tax. A lack of efficiency when collecting and managing the tax has made it quite hard for the Chinese government to determine the grade of progressive tax. Therefore, they argue, a proportional tax is more suited to China's property taxation at the present stage (Qiu and Tu, 2009, p17).

Overall, in this part of the studies, the authors agree that the property tax is a necessary step for China's tax reform, and that local governments should have more rights when making property taxes. But there are still some controversies when setting the rate of property tax.

Comments on the property tax pilots

After the implementation of the property tax pilot, many scholars researched it and drew different conclusions. Some of the studies say that the property tax pilot clearly restrained the price of residential housing.

Wang and Cao used the panel data of 35 large and medium-sized Chinese cities between 2006 and 2012, and used the DID (difference in difference) method to test the influence of property tax pilots in Shanghai and Chongqing. This study shows that the current property tax pilots significantly reduced the price of residential housing. Therefore, the current property tax pilot has played a positive role in the regulation of prices. However, this study also shows that, at present, the property tax pilot also has some limitations – for example, the impact on the prices of luxury residential and commercial housing is not significant (Wang and Cao, 2014, p40).

Additionally, through the comparative analysis of relevant indicators about the investment of real estate enterprises, market sales and rental housing before and after the Shanghai property tax pilot reform, Yin and Wei concluded the effect of property tax was as follows.

Firstly, since the implementation of the Shanghai property tax pilot, although the average price of housing sales continued to grow, the rate of growth weakened. Secondly, Shanghai's real estate bubble continued to increase: annual completed investment in housing by real estate enterprises increased year by year while the corresponding housing sales fell. This shows that the housing vacancy rate continued to rise (Yin and Wei, 2014, p99).

On the other hand, some scholars argue that the property tax pilot cannot achieve the expected goal.

Xu and Wu use a four-quadrant model and cobweb model to analyse the housing property tax pilot. The main conclusions of their study are as follows:

Firstly, with China's current property tax pilot program, higher prices are expected. The property tax levy cannot effectively stabilise the speculative demand. Secondly, the property tax is not the only way of controlling real estate prices. The main function of the property tax

is to change the convergence interval of the real estate market. A single low-strength property tax policy cannot effectively curb the rapid rise in prices. Thirdly, property tax pilot program is too weak to stabilise the price of the real estate market. (Xu and Wu, 2012, 112).

According to Xian, China's property tax pilot covers a narrower range of buildings than other countries, as China's system of property tax is only aimed at urban buildings. What is more, it faces problems such as a narrow tax base, an inflexible tax rate, a lack of tax power in local government and difficulty collecting the taxes. Because of this, a whole set of relevant laws, regulations and property registry systems should be established. The collection and management of property tax should be enhanced. The authority of managing property tax should be given to the grass-roots government (Xian, 2012, p119).

Hukou rules of the property tax pilot in Shanghai

Table 2 has shown the different rules for Shanghai citizens and non-Shanghai citizens. It is obvious that non-Shanghai citizens burdened more finance pressure. Some studies paid attention to the difference about Hukou. Yang asserted that this policy does not comply with the principle of benefit. He held the view that as long as the purchase of a new house in the city, the householder could enjoy the public services without considering the location of Hukou. Generally speaking, the more houses a man owned, the more opportunity for him to enjoy the public service. Therefore, only levying property taxes on the first house of non-Shanghai citizens is not fair (Yang, 2012, p100). In addition, Tao and Shi believed that the different rules about Hukou are a method of the Shanghai municipal government to expand the tax base and increase revenue. However, in the long term, it will discourage the non-Shanghai workers' employment intention, which is not conducive to the development of the city (Tao and Shi, 2011, p125).

2.5 Factors affecting housing prices

There are many studies focusing on the factors influencing the price of residential housing in different countries, and they can be divided into two types. The first is about the influence of the microcosmic relation between supply and demand on residential housing prices.

In 2014, Chen held the view that the consumer confidence index (CCI) reflects subjective judgments of consumers on both the economic situation, and measures on income and pricing. When the CCI increased, the housing prices would increase, and vice versa (Chen, 2014, 52).

Jud and Winkler made use of data taken between 1984 and 1998 in 130 regions, including the United States, with the purpose of analysing the factors affecting actual housing price changes. The conclusions indicated that the increase of housing prices was affected greatly by population growth, actual income, the actual cost of building and real interest rates (Jud and Winkler, 2002, p44).

Peng and Dang referred to the classic linear model in econometric models and came to the conclusion that the main factors impacting the average commercial housing price over the short term in China include the per capita disposable income and unemployment rate. They say these led to average short-term price changes of 85.3% (Peng and Dang, 2015, p140).

It is generally believed that the credit degree is connected to mortgages. McGibany and Nourzad researched the US housing market and concluded that housing prices and mortgages were related over the long term, while there was no clear evidence to prove that they were connected with each other in the short term (McGibany and Nourzad, 2004, p312).

Their study into supply and demand in housing price came to a conclusion on the impact of the following housing price factors: population (including the total amount, structure and number in employment), income (real income), consumption and construction cost. Among them, population and income mainly affected housing prices with regard to demand. Meanwhile, loan interest rates affected both demand and supply (buyers and developers). Regarding methodology, the scholars were inclined to use econometric models such as cross-sectional regression and hysteresis regulation.

The other type of research regards the impact on the macro economy.

Zhu adopted GDP, bank credit, short-term interest rates and inflation from 17 nations, including America, from 1970 to 2003 as the main variables and used the VAR model to come to the conclusion that the growth in housing prices depends on inflation and bank credit, and might exert a greater influence on housing prices due to different mortgage markets in different countries (Zhu, 2004, p77).

Using family income, rent, taxation, the unemployment rate, and family debt from 1985 to 2004 explanatory variables, Dag and Naug adopted the least square method. They found that housing prices were most sensitive to the interest rate. (Dag and Naug, 2005, p39).

Wong and Ho conducted research on the relationship between Hong Kong's real estate prices and the macro economy by means of a distributed lag model, co-integration and an error correction model, and found that GDP, exports, interest rates and inflation rates also influenced real estate prices in the long term (Wong and Ho, 2003, p18).

Otto (2007) said that interest rates and inflation were two key factors of the growth in housing prices over the past 15 years in Australia (Otto, 2007, p235).

Studies in China suggest that the interest rate affects the price to a large extent. For instance, Liu M. and Liu B. thought that the interest rate determined the equilibrium of the price in the long-run and selected the hoteling model to work out the flexibility of the housing price for mortgage rates. From a long-term balance perspective, changes in interest rates exerted a great impact on current housing prices, so an adjustment to interest rates may control prices (Liu and Liu, 2005, p15).

In conclusion, there is a strong correlation between macroeconomic factors (GDP, exports, interest rates and inflation rate) and the long-term impact on housing prices; factors that affect housing prices range from interest rate policy (which is the largest factor) to monetary policy, and these indirectly impact housing prices by influencing the developers' supply and buyers' demand. From the view of methodology, the early studies mainly resort to the supply and demand equilibrium model, whereas a large number of studies in recent years tend to use econometric models.

2.6 Hedonic model

The hedonic price model is designed to handle the relationship between differentiated features and product prices for heterogeneous products. It has been widely applied to the field of real estate. The word hedonic is derived from the Greek word *hedonikos*, meaning pleasure. In the context of economics, the word is used to describe the utility or satisfaction gained from the consumption or use of a product or service.

Real estate is closely related to the daily life and work relationships of many people. As a complicated type of commodity, it can satisfy a variety of needs such as recreation, entertainment and work.

Due to the spatial fixation of real estate, it has quite a distinct heterogeneity, which means that the features composing the use value between products are obviously different from each other. At a micro level, these differences can be reflected in the location, number of storeys, orientation and house structure. On a macro level, it can extend to the policies, economic level and residents' income. Because of these features, the hedonic price model has been widely applied to the property market.

Ridker took the lead in applying the theory to the housing market. By using price-related data in the model, he calculated the effect of the improvement of environmental quality (such as the removal of air pollution) on housing prices (Ridker, 1967, pp.250-255).

At present, the hedonic price model is mainly devoted to evaluating the price index, the appraisal of real estate and the effect of policy.

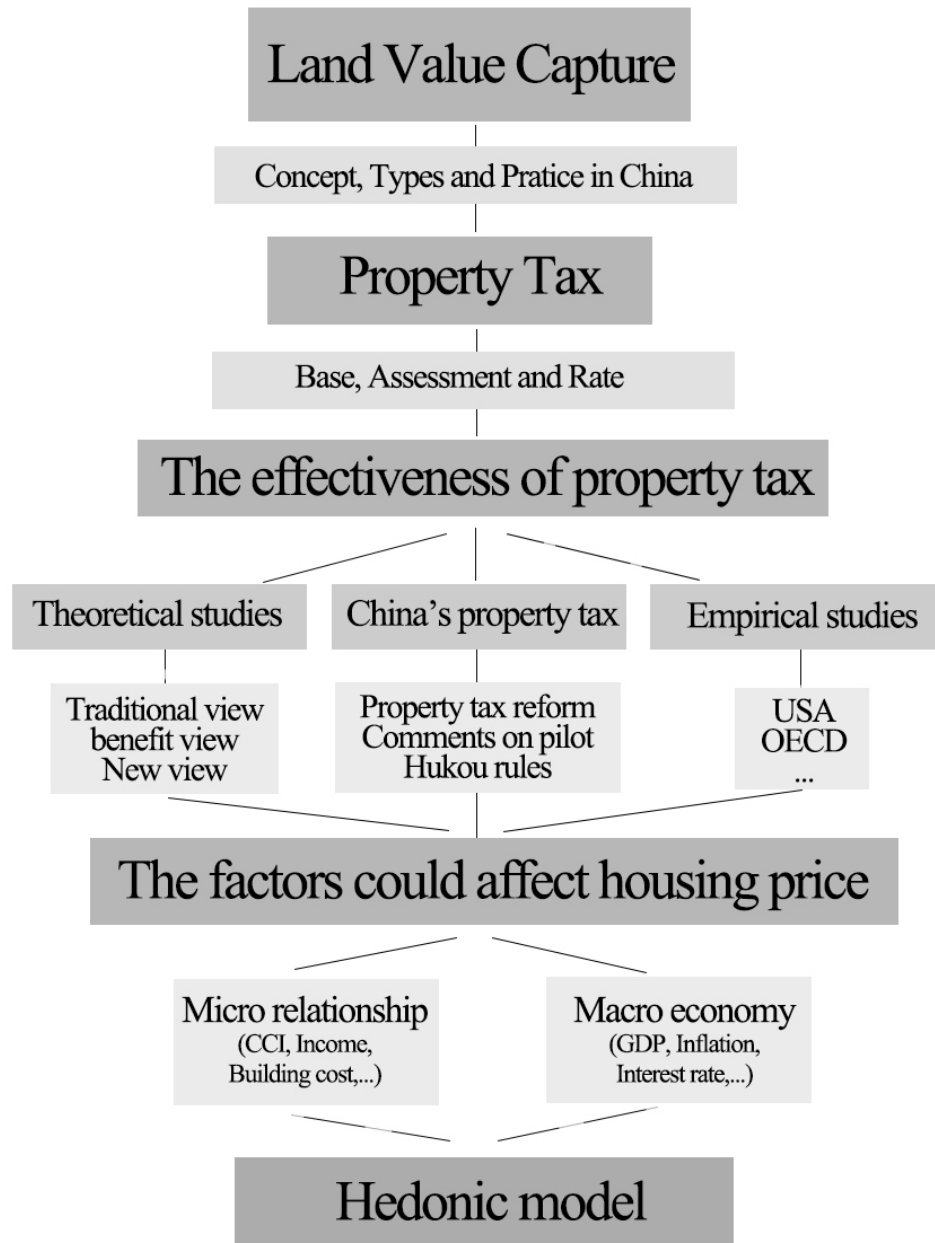
2.7 Conclusion

From the literature review above, we can see that there are many studies about the concept of land value capture and property tax.

In addition, there are three different views about the effect of property tax on residential housing prices in theoretical studies. And the effects of property tax in developed countries have basically been confirmed after years of empirical research. What is more, it is clear which factors might influence the price of houses in both micro and macro respects.

Research about the Shanghai property tax pilot is lacking. Existing studies use the pilot data up to two years and most of the studies stay on the stage of theoretical analysis and descriptive statistics. Few studies connect property tax with factors that could affect the price. Because of this, further research about Shanghai's property tax pilot is necessary.

Figure 3 Conceptual framework (Source: the author)



Chapter 3: Research Design and Methods

3.1 Operationalization

As shown in the literature review, there are four main factors that can affect residential housing prices. The following tables describe and operationalize these concepts.

Table 5 Main concepts

Concepts	Definition
Property Tax	The pilot policy that introduced in Shanghai in 2011 and its revenue
Price of Residential housing	The price of houses sale for residential legally, but excludes the social housing
Macro economy	Regional economy and its overall economic activity as well as status.
Supply-demand relationship	A reflection of the relationship between production and consumption in the real estate market.

In addition, the variables of these concepts, as well as the types and content of the indicators that could reflect the variables, are listed below. The sub-questions of this research are repeated as follows:

Sub-questions:

1. How did the property tax pilot in Shanghai affect the housing price?
2. Could the property tax pilot in Shanghai achieve the goal of restraining the growing residential housing price ?
3. How was the revenue of the property tax used?

Table 6 Variables and indicators

Concept	Variable	Indicator	Type	Sub-question
Housing Price	Residential housing price	Price index of residential housing	Quantitative secondary data	Q1, Q2
		The process and steps the property tax affected housing price	Qualitative data through interview	
Property Tax	Property tax pilot in Shanghai	Property tax revenue	Quantitative secondary data	Q1, Q2, Q4
		The aspects that the revenue of property tax applied to	Qualitative data through interview	Q3, Q4
Supply-	Income	The per capita	Quantitative	Q1, Q2

Concept	Variable	Indicator	Type	Sub-question
Demand relationship		disposable income	secondary data	
	Building Cost	Industrial producer price index		
	Consumer Confidence	Consumer Confidence Index of purchasing housing		
	Completed housing	Floor Space of Residential housing Completed	Quantitative secondary data	
	Investment	Total Investment in Residential Buildings		
	Causation and effect of supply-demand relationship	The causation and effect between above factors and property tax	Qualitative data through interview	
Macro economy	GDP	Gross Domestic Product	Quantitative secondary data	Q1, Q2
	Interest Rate	One year term deposit rate		
	Inflation	Consumer price index (CPI)		
	Mortgage rate	Individual mortgage rate for residential housing		
	Imports and exports	The total volume of import and export commodities		
	Causation and effect of macro economy	The causation and effect between above factors and property tax	Qualitative data through interview	

3.2 Data Collection Methods

This research will use two data collection methods to obtain the data. The first one is through secondary data collection. Most of this data is taken from statistical yearbooks and investigation reports conducted by the National Bureau of Statistics of China, the Municipal Bureau of Statistics of Shanghai, the Administration of Taxation of Shanghai and the social science database of Renmin University of China. Some data was obtained directly through

the websites of these agencies. For the rest of the data, the Municipal Bureau of Statistics of Shanghai and the Administration of Taxation of Shanghai made the data available but only allowed it to be hand copied in Shanghai. The detailed sources of data are in the following table.

Table 7 Agencies and data

Agency or database	Data
National Bureau of Statistics of China	Data about the macro economy (such as GDP, inflation and interest rate)
Municipal Bureau of Statistics of Shanghai	Data about supply-demand relationship of real estate (Such as income, investment and consumers confidence)
Administration of Taxation of Shanghai	Date about the property tax
Social science database of Renmin University of China	Data about the price of residential housing

The other data collection method is in-depth, one-on-one interviews. Since the property tax pilot could involve many different effective factors, it is difficult to completely control and explain all of them just by collecting secondary data. For this reason the in-depth interview provides a good supplement to the secondary data and a way to test the results of the following quantitative model. This study plans to invite six respondents from three different organisations to take part in the in-depth interviews one by one. They are an official from the Real Estate Bureau of Shanghai, a professor from the property tax research centre of Renmin University of China and four salesmen from a real estate development company (two from a private company and two from a national company) in Shanghai. After the interviews, notes will be written to help the following analysis.

When it comes to the time period of the research, data collection occurred over the course of about three weeks between 16 June and 10 July, 2015. Specifically, the first week was spent visiting the Municipal Bureau of Statistics of Shanghai and interviewing the official from the Real Estate Bureau of Shanghai; the second week was used to visit the Administration of Taxation of Shanghai and interview the salesmen from a real estate development company in Shanghai. Finally, the third week was focused on collecting other data online and interviewing the professor from the property tax research centre of Renmin University of China. The total cost of this data collection made up of transportation and hotel costs. There was no extra cost for the data. To sum up, the data was available within a suitable time and budget.

3.3 Sample Size and Selection

When collecting secondary data, the population is variables above in urban area of Shanghai, since this is secondary data collection, the selection of data followed these criteria:

- The data must reflect the real situation, so it must be based on what has happened rather than being predictive data.
- The units of time used in this data should be as small as possible to describe the changes of variables in maximum detail.
- There is no problem of accessibility with the data.

In accordance with these criteria, this research used the monthly data of the variables between Jan. 2011 and Dec. 2014. Monthly data strikes a balance between accessibility and detailed change. Thus there were 48 samples that would fit the following data analysis methods.

The in-depth interviews were conducted with people who have a good knowledge of the Shanghai tax pilot. For a better understanding of the effect of Shanghai's property tax pilot, this study used diversity sampling to ensure that the respondents were from different fields. The selection of interviewees followed these criteria:

- The interviewee should have enough experience and information about the property tax pilot in both Shanghai and their own fields.
- Respondents should be willing to cooperate with the interview and express their true views.

As mentioned above, the interviewees came from a governmental department, an academic agency and Real Estate Company. Thus, their views can be concluded to be close to the fact.

3.4 Validity and Reliability

Validity: As shown in the literature review, the variables chosen in this research were confirmed by many other studies. That is to say, the existing research proved that the variables, if considered in this research, would reflect the real situation of the dissertation's main concept. Specifically, the definition of the indicator of each variable is given in the operationalization section. It ensures that the variables will be fully expressed by the indicator.

Additionally, the participants in the in-depth interviews are outstanding talents in their fields. Their views are credible. This study will strictly follow interview procedures to avoid the respondents being dishonest because of outside factors.

Reliability: All of the secondary data is taken from professional surveys of governmental departments. For the economic data in China, there is no doubt that relevant governmental departments hold the most detailed and comprehensive data. In addition, the secondary data and in-depth interviews will be double-checked to test their reliability.

3.5 Data Analysis Methods

In this research, quantitative and qualitative methods were both included in the data analysis methods. Specifically, in the next chapter, a hedonic price model will be constructed in SPSS software to analyse the data. The theory of hedonic price model states that the real estate market is composed of various characteristics, and that real estate prices are composed of all the utility of characteristics could bring to people. As the number and the combination of the characteristics are different, the price of real estate differs. In recent years, more studies have extended the characteristics from physical factors to the economic level. When the study is focusing on the whole city, there is no need to consider the location and other micro factors. In order to measure the effect of certain policies on housing price through the hedonic price model, four steps of data analysis will be followed. These are as follows:

There are four steps of data analysis as follows.

- Descriptive statistical analysis of collected data,
- Correlation and causation analysis of different indicators,
- Analysis of variance of different indicators,
- Coefficient analysis of different indicators.

Through these four steps, this research will come to the following conclusions:

- The extent to which the property tax could directly affect the price of residential housing in Shanghai (positively or negatively) during controlled other factors.
- The influence of property tax on the other factors (indicators) that could affect the price of residential housing.

As a supplement, this study will make a qualitative analysis on the interview results, mainly through interview memos, to summarise the views of respondents on the effectiveness of the property tax pilot on the price of Shanghai's residential housing. These views were compared with the results of the quantitative model to obtain the final conclusions.

Chapter 4: Research Findings

4.1 Quantitative research

This study employed the hedonic price model, a kind of multivariable linear regression model. The data came from between January 2011 and December 2014 and is all secondary data collected from the official departments, either from their websites or hand copied at their offices.

There are eleven independent variables and one dependent variable in this study. In order to apply the quantitative variables and indicators correctly and exactly, the detailed definitions are given in the following table.

Table 8 Definitions of the quantitative indicators

Indicator	Definition	Unit
Price index of residential housing (PI)	The adjusted actual price of residential housing in Shanghai's urban area.	U.S Dollar
Property tax revenue (PT)	The tax revenue levied according to Shanghai's property tax pilot policy.	U.S Thousand Dollar
Income (INC)	In the survey period, the total income (including wage income, net operating income, property income, transfer income) minus the individual income tax and social security expenditure.	U.S Dollar
Building Cost (BC)	The price index of intermediate inputs for industrial production including raw materials, fuel, power, value-added tax and freight tariffs.	Fixed base index, based on 2011.02
Consumer Confidence Index (CCI)	Reflection of the subjective feelings of consumers on the current economic situation and the housing consumption (Chen, 2014).	Index between 0-200
Completed housing (CH)	During the reporting period, the total completed residential housing area in accordance with the design requirements.	Million square meter
Investment (INV)	Within the reporting period, the total investment of real estate development enterprises in housing construction projects and land development projects.	Million U.S. Dollar
GDP	The total value of all final products and services produced by all resident units in a country or region within a certain period.	Million U.S. Dollar

Indicator	Definition	Unit
Interest Rate (IR)	The rate of return that banks use to calculate the reward paid for those making one-year term deposits.	Percentage
Inflation (INF)	The main indicator reflecting inflation and the price level of consumer goods and services.	Index between 0-200
Mortgage rate (MR)	The rate of the over five years' loan that borrowers should pay to banks in order to purchase individual residential housing.	Percentage
Imports and exports (IE)	The import and export data of enterprises registered in Shanghai.	Million U.S. Dollar

4.1.1 Outliners

The first step before the analysis is to screen data and check for outliers. These have a great influence on the estimate parameters and can bias the result.

The standardised residual is used to check the outliners. Generally, standardised residuals with an absolute value greater than 3 can be regarded as outliners.

All data was put into SPSS and the results are shown in Appendix 2. They indicate that all the absolute values of residuals of independences are within 3. Therefore, there is no outlier in this data.

4.1.2 Hypotheses of the analysis

The main hypotheses of the model are stated as below.

- H_0 : Property tax (PT) does not predict the price of residential housing.
- H_1 : Property tax (PT) predicts the price of residential housing.

And there are ten specific null and alternative hypotheses (See Appendix 1).

4.1.3 Statistical test

This part checks for violations of various assumptions before conducting the hedonic model (multiple linear regression analysis) to evaluate how well the independences, especially property tax, predicted the price of residential housing.

Measurement level

The first assumption concerned the measurement level of the variables. The assumption was met, as both dependent and independent variables were continuous.

Normality

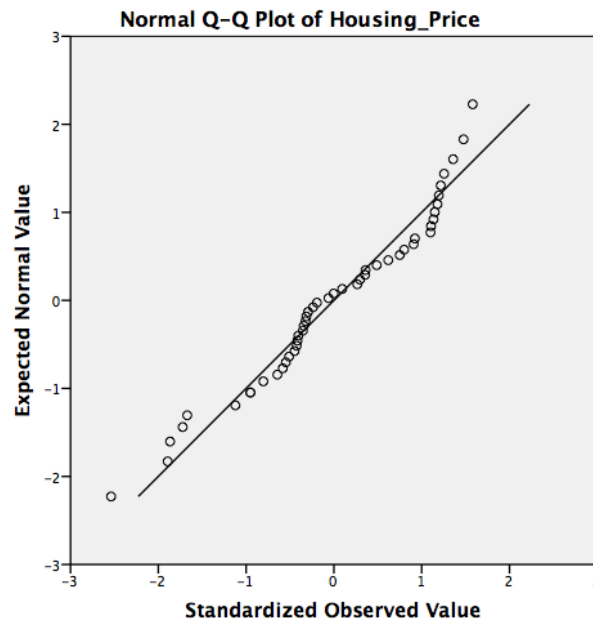
The second assumption was the assumption of normality of dependence.

The Normality data should be normally distributed. In other words, if a vertical line were drawn in the centre of the data image, both sides would be the same. Data that is not normally

distributed could bias the parameter estimates and confidence interval, making the p value inaccurate.

Q-Q plots of the standardised residual showed that the points were distributed closely along the line. Therefore, the assumption of normality was met (see Figure 4).

Figure 4 Q-Q Plot for price of residential housing



Linearity

The third assumption was the assumption of linearity. In a multi-linearity regression, the linearity is the most important assumption. Without it, the model is invalid. The assumption was met as the scatterplots of the dependent variable (PI) against the independent variables (PT, INC, BC, CCI, CH, INV, GDP, IR, INF, MR, IE) indicated a linear relationship between the dependent variable and independent variables (see Figure 4, Figure 5 and Figure 6).

Figure 5 Scatterplots of the relationship between the dependent variable (PI) and three independent variables (PT, INC, BC).

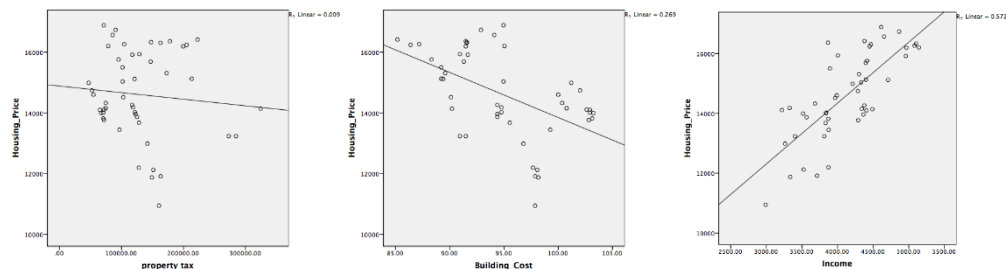
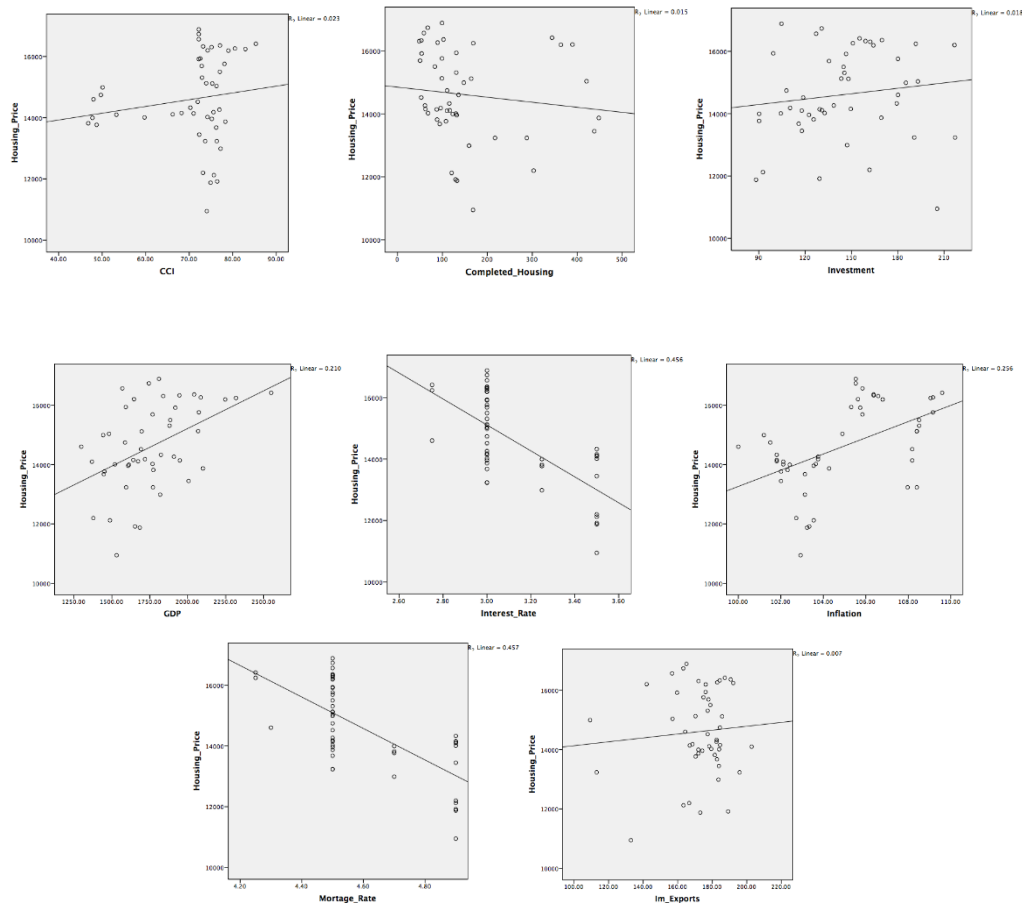


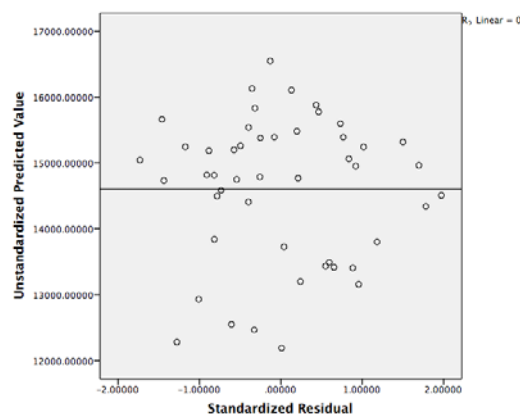
Figure 6 Scatterplots of the relationship between the dependent variable (PI) and eight independent variables (CCI, CH, INV, GDP, IR, INF, MR, IE).



Homogeneity

The fourth assumption was the assumption of homogeneity. This is used to make sure that the method of least squares would be optimal. A scatterplot of the standardised residual against the standardised predicted value showed that the assumption was met as the points were randomly distributed (see Figure 7).

Figure 7 scatterplot of the standardized residual against the standardized predicted value



Multi-collinearity

The fifth assumption was the assumption of there being no perfect multicollinearity. Multicollinearity means there is a great correlation between independent variables. This would make the b value incorrect and limit the effect size (R square) and the importance of predictors.

The assumption was checked using collinearity diagnostics.

Table 9 The Collinearity of independences

Model ^a	Collinearity Statistics	
	Tolerance	VIF
Property Tax	.473	2.113
CCI	.154	6.484
Completed Housing	.658	1.520
Investment	.601	1.663
GDP	.408	2.451
Interest Rate	.002	541.013
Inflation	.080	12.485
Mortgage Rate	.002	544.398
Im/Exports	.694	1.441
Income	.587	1.702
Building Cost	.030	33.604

a. Dependent Variable: Housing Price

Table 10 Collinearity Diagnostics ^a

Model Dimension	Interest Rate	Inflation	Mortgage Rate	Building Cost
1	.00	.00	.00	.00
2	.00	.00	.00	.00
3	.00	.00	.00	.00
4	.00	.00	.00	.00
5	.00	.00	.00	.00
6	.00	.00	.00	.00
7	.00	.00	.00	.00
8	.00	.00	.00	.00
9	.00	.01	.00	.00
10	.00	.06	.00	.12
11	.01	.92	.02	.86

12	.99	.01	.98	.02
a. Dependent Variable: Housing_Price				

The Tolerance and VIF can represent the level of multicollinearity. The Variance Inflation Factor (VIF) could represent the tolerance, the bigger the VIF, the more prominent the multicollinearity. Experience shows that: when the $0 < VIF < 10$, there is no multicollinearity; when $10 < VIF < 100$, there is some multicollinearity; when VIF is larger than 100, there is strong multicollinearity.

As seen in Table 9, there is multicollinearity in the Interest Rate (VIF=541.013), Inflation (VIF=12.485), Mortgage rate (VIF= 544.398) and Building Cost (VIF=33.604). In addition, Table 10 indicates that there is a strong correlation between Interest Rate (0.99) and Mortgage Rate (0.98). And there is also correlation between Building Cost (0.86) and Inflation (0.92).

Thus, it is necessary to exclude at least variables of them. Based on the background of China, the central bank always adjusts the interest rates and mortgage rates at the same time. Their growth and deceleration are basically consistent. This is why there is multicollinearity between them. However, the impact of interest rates is more extensive, so the mortgage rate has been excluded. Also, the correlation between building cost and inflation suggests that, to a large extent, the changes of the building cost are due to the fluctuation of inflation. For this reason, it is better to exclude the Building Cost.

Independent errors

The sixth assumption was the assumption of independent errors. This says that the errors in a model are not related each other. If the errors were not independent, the confidence interval and significance tests would be invalid.

Durbin-Watson was used to check whether the residuals in the model are independent. The data met the assumption of independent errors with the Durbin-Watson value of 1.304.

Regression

After checking that the assumptions were met, we conducted a multiple linear regression with PI as the dependent variable and PT, INC, CCI, CH, INV, GDP, IR, INF and IE as the nine independent variables. The regression method is Enter. Thus all the effects of the variables will be shown. Results of the multiple linear regressions with SPSS14.0 software are as follows:

Table 11 Variables Entered/Removed ^a

Model	Variables Entered	Variables Removed	Method
-------	-------------------	-------------------	--------

Im/Exports Income property tax Completed Housing Interest Rate CCI, Investment, GDP, Inflation ^b	No variable removed	Enter
a. Dependent Variable: Housing Price b. All requested variables entered.		

This paper selects the enter regression, all the variables were entered into the model (see Table 12), Price index of residential housing (PI) is the dependent variable.

Table 12 Model Summaries

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.901 ^a	.811	.767	696.151
a. Predictors: (Constant), Im/Exports, Income, property tax, Completed Housing, Interest Rate, CCI, Investment, GDP, Inflation				

R Square presents the proportion of the Sum of Squares of Deviations that can be explained by sum of squares for regression. It is a statistic to find the Goodness of Fit. A higher R Square means a more accurate model and a more significant regression effect. In this model (see Table 13), the R Square is 0.811 and the adjusted R Square is 0.767, near to 1. That is to say, 81.1% of the changes of the dependent variable could be explained by the independent variables in this model. There is a linear relationship between the dependent variable and independent variables.

Table 13 ANOVA ^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	79227581.826	9	8803064.647	18.17	.000 ^b
Residual	18415822.090	38	484626.897		
Total	97643403.917	47			
a. Dependent Variable: Housing Price b. Predictors: (Constant), Im/Exports, Income, property tax, Completed Housing, Interest Rate, CCI, Investment, GDP, Inflation					

Table 14 indicates that this model has an *F value* of 18.17 and *p (Sig.)* < 0.001. Therefore, the model is significantly good at predicting the dependent variable.

Table 14 Coefficients ^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3479.072	7927.208		.439	.663
Property tax	-.009	.002	-.384	-3.796	.001
Income	1.055	.244	.392	4.318	.000
CCI	-4.396	15.122	-.030	-.291	.773
Completed Housing	-.979	1.074	-.074	-.911	.368
Investment	1.049	3.872	.025	.271	.788
GDP	1.325	.566	.239	2.342	.025
Interest Rate	-2285.387	594.913	-.366	-3.842	.000
Inflation	118.239	75.877	.219	1.558	.127
Im/Exports	3.616	6.641	.045	.545	.589

a. Dependent Variable: Housing Price

From Table 15, it can be drawn that Property tax, $t(38) = -3.796$, $p < 0.05$, Income, $t(38) = 4.318$, $p < 0.05$, GDP, $t(38) = 2.342$, $p < 0.05$ and Interest Rate, $t(38) = -3.842$, $p < 0.05$, made a significant contribution to the hedonic model. However, the rest of predictors are not significant for the model since their p value (Sig.) are larger than 0.05.

Table 15 Model Summaries

Model	R	R Square	Change Statistics				
			R Square Change	F Change	df1	df2	Sig. F Change
1	.888 ^a	.788	.788	40.028	4	43	.000
2	.901 ^b	.811	.023	.931	5	38	.472

a. Predictors: (Constant), Interest Rate, property tax, Income, GDP

b. Predictors: (Constant), Interest Rate, property tax, Income, GDP, Completed Housing, Im/Exports, Investment, CCI, Inflation

By dividing the independent variables into two groups in regression, it is obvious that the Sig. F Change could be contributed by Completed Housing, Imports and exports, CCI and Inflation are not significant ($0.472 > 0.05$). Therefore, these six variables are excluded from the model.

Table 16 Coefficients of the model ^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2546.29	2474.429		6.380	.000
Property tax	-.007	.002	-.307	-3.757	.001
Income	1.217	.226	.452	5.378	.000
GDP	1.633	.469	.295	3.478	.001
Interest Rate	-421.670	86.675	-.418	-4.865	.000

a. Dependent Variable: Housing_Price

By replacing the b-value, the equation of the specific hedonic model could be defined:

$$PI = b_0 + b_1PT_i + b_2INC_i + b_3GDP_i + b_4IR_i$$

$$= 2546.29 + (-0.007 PT_i) + (1.22 INC_i) + (1.63 GDP_i) + (-421.670 IR_i)$$

Findings

From the results of the multiple linear regression analysis, it can be concluded that four of the specific null hypotheses were also rejected.

The first specific null hypothesis, that Property Tax (PT) does not predict the price of residential housing, was rejected as PT significantly predicted aggressive price of residential housing ($p = .001$), an increase in PT was associated with a decrease in the price of residential housing ($b = -0.007$). This b value indicates that as Property Tax increases by one unit, the price of residential housing decreases by 0.007 units. Therefore, for every extra \$1000 of revenue from property tax, the price of residential housing will drop by \$0.007. This interpretation is true only if the effects of income, GDP and interest rates are held constant. To sum up, the property tax pilot in Shanghai has a negative effect on the price of residential housing especially in long term.

The second specific null hypothesis, that Income (INC) does not predict the price of residential housing, was rejected as INC significantly predicted aggressive price of residential housing ($p = .000$). An increase in INC was associated with an increase in the price of residential housing ($b = 1.217$). This b value indicates that as income increases by one unit, the price of residential housing increases by 1.217 units. Therefore, for every more \$1 from income, the price of residential housing will rise by \$1.217. This interpretation is true only if the effects of property tax, GDP and interest rates are held constant. In conclusion, when the income of Shanghai citizens is higher, the housing prices are higher.

The third specific null hypothesis, that GDP does not predict the price of residential housing, was rejected as GDP significantly predicted aggressive price of residential housing ($p = .001$). An increase in GDP was associated with an increase in the price of residential housing ($b = 1.633$). This b value indicates that as GDP increases by one unit, the price of residential housing increases by 1.633 units. Therefore, for every extra million dollar in GDP, the price of residential housing will rise by \$1.633. This interpretation is true only if the effects of

property tax, income and interest rate are held constant. As with the income, a growing GDP could push housing price higher.

The fourth specific null hypothesis, that the interest rate (IR) does not predict the price of residential housing, was rejected as IR significantly predicted aggressive price of residential housing ($p = .000$). An increase in IR was associated with a decrease in the price of residential housing ($b = -421.670$). This b value indicates that as the interest rate increases by one unit, the price of residential housing decreases by 421.670 units. Therefore, for every more 1% from IR, the price of residential housing will decline \$421.670. This interpretation is true only if the effects of property tax, income and GDP are held constant. The interest rate is the most effective factor on housing prices. It is a strong tool for governments that want to control housing prices. However, as a strong fiscal policy, every change of the interest rate must be cautious.

4.2 Qualitative research

The quantitative research above has already shown the statistical relationship between the price of residential housing and independent variables. However, the hedonic regression model can only reflect the effects and results of Shanghai's property tax pilot on the housing price. It is important to know the reasons and processes behind these effects, and so it was necessary to conduct qualitative research in the form of in-depth interviews exploring the causation and the other effects of property tax.

One official from the real estate bureau of Shanghai, one Professor from the property tax research centre at Renmin University of China, four salesmen from real estate companies and two citizens from Shanghai are included in the in-depth interviews. The interviews were conducted in the offices or home of the interviewees at times suitable for them.

The following table reflects an outline about the opinions of different interviewees on the indicators. In addition, the detailed views of interviewees will be explained by indicators.

Table 17 Outline of opinions about the effect of factors on housing price

	Governmental opinion (1 person)	Academic opinion (1 person)	Operator opinion (4 people)	Citizens opinion (2 people)
Property tax	Long term negative effect	Small negative effect	Effect on middle income people	Worthy considering
Income	Significant positive effect	Significant positive effect	Significant positive effect	The most important factor
Building Cost	No effect	No effect	Only affected by inflation	Slight positive effect
Consumer Confidence	Slight positive effect	Slight positive effect	Slight positive effect	Slight positive effect
Completed Housing	Slight negative effect	Slight negative effect	Slight negative effect	Slight negative effect
Investment	No effect	No effect	Slight positive effect	Slight positive effect

GDP	Significant positive effect	Significant positive effect	Significant positive effect	Significant positive effect
Interest Rate	Significant negative effect	Significant negative effect	Significant negative effect	Significant negative effect
Inflation	No effect	No effect	No effect	No effect
Mortgage Rate	Significant negative effect	Significant negative effect	Significant negative effect	Significant negative effect
Import and Export	No effect	No effect	No effect	No effect

Property tax

All the interviewees think property tax is an effective variable, but their detailed explanations are different to some extent.

Long-term effect

Ineffective results in the pilot's locations in Shanghai are often used to indicate the ineffectiveness of the collection of property tax in restraining excessive rises in housing prices. An opinion from the governmental representative⁴ was that there are two misunderstandings here. First, the property tax pilot is only one important link in guiding reasonable housing consumption; secondly, such queries mix long term effects with the short-term effect of the property tax pilot, thus leading to a lack of understanding. The housing property tax scheme in Shanghai is a pilot scheme whose significance lies in the experience it can provide for national property tax reform in the future.

The influence of property tax pilot on housing prices in the short term can be ignored. However, from middle and long-term perspectives, the influence of property tax on the real estate market is great. At present, tax on real estate mainly exists in transactions, with almost no tax on held property. However, considering the basic supply and demand situation of the real estate market, the tax-in-transaction link can easily be transferred to the buyer, which will not decrease housing prices. If the tax on held property can be increased, rich housing owners will be willing to sell rather than hold their real estate, thus increasing the housing supply and having the effect of reducing housing prices. From this perspective, property tax is necessary for the pilot.

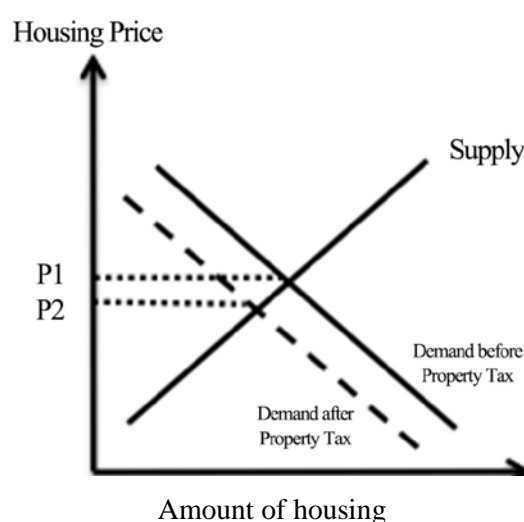
Furthermore, the property tax pilot could improve the Chinese financial and taxation system, providing local finances with a stable and long term income source with the purpose of raising funds for city development. The financial distribution system of China, which is heavy at the top and light at the bottom, leads to the increased shrinking of local government revenue and limited financial resources, as well as excessive dependence on land finances. As a result, it is extremely urgent to look for stable local financial resources. Collecting individual housing property tax is optimal choice.

Effective but with a low tax rate

⁴ Response by Haisheng Liu (Chief of real estate bureau of Shanghai), interviewed by the author on 20 June 2015

The opinion from the academic expert⁵ argued that the policy effect of property tax mainly acts on housing demands. Currently, housing demands in China are composed of rigid demands, supportability demands and speculative demands. Ever since the financial crisis of 2008, hot money flew into the real estate market and real estate speculation became increasingly serious with speculative demands taking up a large proportion. If the force of the property tax exceeds the influence of the future inflation rate that people expect, supportability demands for house purchases may decrease; if the forces of property tax exceed the real estate speculation revenue that people expect, speculative demands may decrease. The mechanism of property tax influencing housing price is that it influences people's future expectations by increasing the holding cost of the housing expectations, so as to reduce housing demand and the housing prices. Figure 8 indicates that the property tax decreased the demand of residential housing (the demand curve moves towards the left). As a result, the equilibrium price of housing price dropped.

Figure 8 The demand-supply relationship of housing price



From the effects of adjusting housing price, Shanghai levied taxes on incremental houses, it was effective on these kinds of houses, but the effects are limited. The property tax rates in most parts of America remain between 0.8% and 3%, with most about 1.5%; Germany levies up to 3.5% of the property; the tax rate in Korea is 0.75% to 2% every year. The tax rates in these countries are obviously higher than the 0.6% used in China. Comparison shows that the tax rate of Shanghai's property tax pilot is too low and insufficient.

Control of housing prices involves many factors and it is difficult to manage; revenue cannot shoulder the whole burden by itself, nor can it "take the lead". Multiple levers such as credit, land and security of the housing supply should be applied comprehensively and play their roles in] supply and demand so as to reach the desired effect of adjusting housing prices.

Focusing on middle-income people

⁵ Response by Weidong Qu (Vice Professor from the property tax research centre in Renmin University of China); interviewed by the author on 24 June 2015

The opinion from operator interview⁶ was that the buying intentions of middle-income people are most influential (especially the people who want to buy a second house). Thus, the demand declined slightly. Most consumers have considerable confidence in housing price control policies such as the new property tax pilot. They believe that if the property tax is issued nationwide, the rise of housing price will be restrained effectively. Even if the housing price still rises, the growth will be slowed down in consideration of the time value of money, inflation and other elements. Therefore, many people choose to wait. In other words, demand declined.

Even the citizens do not have a good knowledge of the property tax. Their views are important. From the citizens' points of view⁷, property tax will become a factor that they will take into consideration when they want to purchase a second house. However, the effect heavily depends on the price of housing, since the property tax will be calculated by the sale price of housing. The more expensive it is, the more tax should be paid. They think most middle-income families should balance these two factors. Nevertheless, they indicated that the housing demand for those people without a Shanghai Hukou. Marriage and education⁸ are main reasons they have for buying houses. Hence, the impact of the property tax pilot is not significant.

Income and GDP

Generally, income will increase with GDP. When a region has a higher GDP, people who work there can get higher salaries. All of the interviewees hold the view that these two factors could affect the price of residential housing significantly.

First of all, housing as an investment differs from the traditional forms of investment goods such as stocks, bonds, funds etc. Housing is a consumer good. When consumers intend to purchase housing, they must take care of the ratio between the housing price and their disposable income.

The academic interviewee emphasises that the view that the housing of Shanghai is inherently too expensive to purchase is wrong. High levels are maintained because those who can afford to pay high prices are willing to do so. Thus, increasing income is an extremely important factor to push the housing price up. The Shanghai citizens also think income is the most effective factor on housing price.

For the same reason, GDP is a common indicator of economic development. The boom of the regional economy will increase the cost of housing components, especially the price of land.

Building Cost

All the interviewees hold the view that both consumer confidence and completed housing could have a small effect on housing price, though this effect is not significant, because the supply of Shanghai's real estate market is not enough to meet the demand. To a certain extent, it can be considered as a seller's market. The effect of consumer confidence is limited.

As to the completed housing, the number of completed houses is far from meeting the housing demand. Therefore, increasing the supply to constrain the housing price cannot play a large role.

⁶ Response by Mr. Bi, Mr. Song, Mr. Li and Mr. He (Salesmen from Poly real estate company and Dragon Lake real estate company); interviewed by the author on 26.27 June 2015

⁷ Response by Mr. Chen and Ms. Lin (Citizens of Shanghai); interviewed by the author on 22 July 2015

⁸ In China, only the people have their house in an area they can enjoy the education of that area.

Consumer confidence and completed housing

All the interviewees hold the view that both consumer confidence and completed housing could have a small effect on housing price, though this effect is not significant. Because the supply of Shanghai's real estate market is not adequate to the demand. To a certain extent, it can be considered as a seller's market. The effect of consumer confidence is limited.

As to the completed housing, the number of completed housing is far from meeting the housing demand. Therefore, increasing the supply to constrain the housing price could not fully play a role.

Investment

Interviewees hold different opinions about investment. Opinions from the governmental and operator areas are that investment has no effect on housing prices. Specifically, on the demand side, investment does not affect consumer demand. On the supply side, as mentioned before, the demand is much larger than the supply. Thus the positive effect of investment on the supply is not enough to affect the housing price.

However, the rest of the group interviewees believe that more investment means investors will require more return, thus increasing the housing price.

Interest Rate and Mortgage Rate

All of the interviewees assert that the interest rates and mortgage rates have significant effects on the price of residential housing.

Regarding supply, for real estate investors when the interest rate is lower, the investment cost is lower, therefore the investment income is higher, so the more one can stimulate the real estate investment, the more one will increase the supply of real estate. Meanwhile, the higher the interest rate, the higher the investment cost, the lower the investment income, the less money is invested, hindering the real estate supply.

On the demand side, modern consumer loans and overdrafts have become the mainstream options for consumers, especially when purchasing houses, almost all of them need to go bank to borrow money. Interest rates can affect the cost of consumer loans, and it is clear that when the bank interest rates lower and the cost of consumer loans is decreased, consumers are more likely to take loans to buy a house. The housing demand increases and the housing prices may increase. Conversely, when the bank interest rates rise, the cost of consumer loans increases and this hinders consumers looking to get a loan to buy a house, reducing the housing demand, and in turn possibly lowering prices.

Inflation and Exports & Imports

All of the interviewees think these two factors do not have significant effect on housing prices. Inflation is always rising, and so could not contribute much to the change of housing prices.

In addition, there is no direct relationship between Exports & Imports and housing prices.

Social Housing

As well as the impact of the above factors, the interviewees were asked questions about the impact of property tax on social housing, because property tax is not only a means to control prices, but also the tool of land value capture. On 6 February 2011, the Chinese Ministry of Finance issued a document saying that on the basis of the existing capital of supportability social housing project, part of the government's capital revenue, the urban construction and maintenance tax obtained from local government, and revenue from the property tax pilot

project, would be used in the construction of social housing to ensure that there is not a financing gap.

All of the interviewees think it is a good policy, but they hold different explanations.

An opinion from the governmental side⁹ was that using property tax in social housing construction indicates that the forces of property control are increasing continuously.

It is a good supplement that all revenue from property tax will be used to construct the social housing. The construction fees for social housing in Shanghai are about 0.12 billion dollars, 22% of which is from property tax, based on Shanghai's final accounts in 2014. However, developing social housing based solely on property tax is unrealistic.

Moreover, since using the revenue from property tax in social housing construction has earned positive public opinion to some extent, the next step is to either experiment with the tax in other cities, or implement it nationwide. Once property tax reform succeeds, it is beneficial to complete the main tax category and make space for added-value tax and other turnover tax and structural tax reduction reforms. In addition, property tax marketisation can be used as a means to safely lower the real estate market bubble, which would be a great contribution to Chinese economic development.

The opinion from the academic side¹⁰ is that property tax being used in social housing construction indicates that the achievements of reforms benefit the general public, and the tax has realised the principle of "from the people, for the people". When property tax was first experimented with, a major concern and argument was whether local government could use property tax as earmarked and whether it could be used to improve people's livelihoods and social housing. Currently, from the attitude of the pilot project city, Shanghai, and the Ministry of Finance, it would appear that the nation's attitude to property tax being used in social housing construction is clearly positive, which shows that it is worth implementing property tax pilots in other cities.

The opinions from the operators¹¹ are that property tax brings more opportunities for real estate companies to build social housing. Increasing this supply may contribute to controlling housing prices.

However, for the Shanghai citizens themselves, although the government promised that revenue from property tax would be used in social housing construction, the standard of entrance to obtain social housing is very high. As a result, ordinary citizens have few chances to enjoy the benefits. Thus, for this part of policy, the effect is not obvious.

4.3 Comparison

Based on the analysis of both quantitative and qualitative researches, it is necessary to make a comparison.

The in-depth interviews provide sufficient evidence to support the hedonic model. In the qualitative research, there are five factors have been considered as obviously effective

⁹ Response by Haisheng Liu (Chief of real estate bureau of Shanghai), interviewed by the author on 20 June 2015

¹⁰ Response by Weidong Qu (Vice Professor from the property tax research centre in Renmin University of China);, interviewed by the author on 24 June 2015

¹¹ Response by Mr. Bi, Mr. Song, Mr. Li and Mr. He (Salesmen from Poly real estate company and Dragon Lake real estate company);, interviewed by the author on 26.27 June 2015

variables. A similar result is obtained in quantitative research. In the hedonic model, four predictors are included (property tax, income, GDP and interest rate) and the mortgage rate is excluded. Because mortgage rates and interest rates have high multicollinearity relationships, including the mortgage rate will lead to invalid results. In conclusion, the hedonic model is relevant to this purpose and has real significance.

However, some slightly effective factors that interviewees mentioned, such as the consumer confidence and completed housing, are not included in the model. There are two possible reasons for the difference. Firstly, the effect of these factors is too slight to be reflected in the model based on Shanghai's situation. Secondly, this property tax pilot is very new, having begun in 2011. Just four years of data is not enough to make all of the facts clear. More data is required.

Chapter 5: Conclusions and recommendations

5.1 Research conclusions

Based on the findings of quantitative research and qualitative research, the conclusions are as follows.

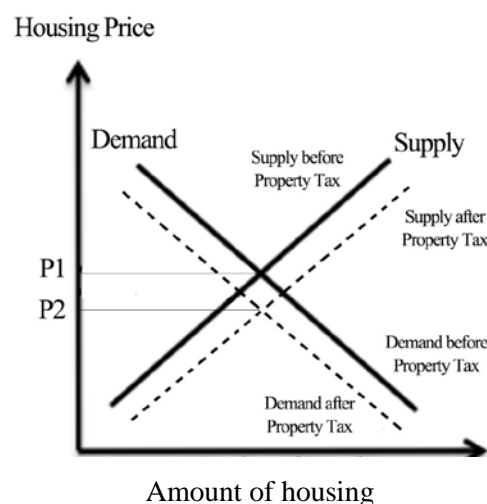
How did the property tax pilot in Shanghai affect the housing price?

On the demand side, for those who hold a Shanghai Hukou, the property tax is effective only when they are planning to purchase a second house, especially for investment and speculation. The property tax pilot would raise the cost of holding houses since people would pay property tax annually. If the expenditure of property tax exceeds the revenue from renting or speculating, people will not purchase the extra house. In addition, when the return rate of buying an extra house is lower than other investments, people will also give up the purchase. Therefore, the demand of residential housing could be reduced by property tax. However, for people who do not hold a Shanghai Hukou, this policy is not that influential. Purchasing a house is necessary for them since they only have the right to buy one house. Their purpose for buying the house is for living. The property tax pilot will not decrease their demand significantly. To sum up, the total demand of residential housing in Shanghai will drop because of the property tax pilot.

On the supply side, as mentioned before, some people who intend to buy an extra house will abandon their plan thanks to the new property tax policy. For the same reason, some citizens who already have two houses (with the second house for the purpose of investing and speculating) may choose to sell one. This will increase the supply of residential housing. What is more, according to the details of the policy, all the revenue from property tax will be used to build social housing, which will also increase the supply of residential housing.

A conclusion can be drawn that the property tax has a negative effect the housing price by decreasing the demand and increasing the supply. According to Figure 9, the demand curve moved towards left and supply curve moved towards the right. Therefore, the housing price dropped from P1 to P2. The demand-supply relationship kept the balance at a lower price.

Figure 9 The demand-supply relationship of housing price (Source: the author)



Could the property tax pilot in Shanghai achieve the goal of restraining the growing price of residential housing?

According to the equation of the hedonic model,

$$\text{Housing Price} = 2546.29 + (-0.007 \text{ PT}_i) + (1.22 \text{ INC}_i) + (1.63 \text{ GDP}_i) + (-421.670 \text{ IR}_i).$$

This b value (-0.007) indicates that as Property Tax increases by one unit, the price of residential housing decreases by 0.007 units when other factors are held constant. That is to say, every extra 1000 U.S. dollars of property tax could lead to a \$0.007 drop in the housing price.

The effect seems very slight. Nevertheless, the policy only focuses on the newly purchased houses from 2011 onwards. In other words, at beginning, the tax base is very small. However, the tax base will keep broadening. In 2014, the revenue of property tax of Shanghai was about 0.04 billion dollars, thus about 280 dollars are controlled. To sum up, property tax will affect the housing price in the long term rather than in a short time.

In the long term, it will fall into the vicious circle of more regulation being followed by higher housing prices. Hence, it is not an ideal long-term regulation mechanism. In contrast, the imposition of property tax can add to the holding cost of the scalpers and speculators and thus force them out of the housing market. In consequence, it will reduce the speculative need and control the irrational rise of housing price.

In summary, property tax can be used as an effective long-term tool for restraining the growth of housing prices.

How is the revenue of the property tax used?

The Shanghai property tax pilot is not only a tool to control increasing housing prices, but also a method to capture the land value. The central and local governments wanted to achieve these two goals at the same time. Therefore, all the revenues of the property tax pilot in Shanghai are used to build social housing. Moreover, the increase in social housing could increase the supply of residential housing. It contributes to the control of housing prices.

It is also a good way to fix the issue that local finance depends heavily on the land transaction fees, even though land is limited. The tax is a stable income that provides social housing to low-income people.

To what extent did the property tax pilot in Shanghai affect the price of residential housing between 2011 and 2014?

Based on the answers to the sub-questions, a conclusion can be drawn that between 2011 and 2014 the property tax pilot in Shanghai affected the price of residential housing significantly.

When compared with the literature review, the result of this study agrees with the *new view* that capital can flow freely, and that the elasticity of supply of capital is zero. The property tax will be fully placed upon the owners of capital. In order to pay less tax, capital owners will transfer the capital to low tax areas when a regional tax rate is higher than the national average level. The introduction of new or higher property tax will cause a decline in housing prices. As to the *traditional view* that the burden of tax will be transferred to the consumers, thus increase the housing price. The Shanghai property tax pilot could only increase the holding cost of the housing to owners rather than real estate companies. The policy neither increased the demand nor decreased the supply. Therefore the traditional view does not fit for the property tax pilot. Finally, the *benefit view* that property tax has no effect on the housing price, since it is a payment for a public service. In fact, the house owners who paid property tax did not enjoy more public services. All the revenues of the pilot were used to build social

housing, but the families that already own one house have no right to purchase this housing. To sum up, the result of this research does not agree with the benefit view.

Also, this research has shown that policies similar to the Shanghai property tax pilot obtained similar effects in other countries.

However, some factors such as building costs, investment and completed housing that are effective in other countries do not play important roles. It shows Shanghai, as one of the biggest cities in China, has its own special situation.

5.2 Recommendations

The property tax pilot will form a constraint on the demand and supply in the property market. Besides restraining speculation in the property market, it can also reduce the vacancy rate of residential housing as well as stimulating the housing rental market. However, it should still improve the taxation and supporting policies in two respects.

Firstly, the scope of the property tax pilot should be enlarged and the rate of property tax should be adjusted in a dynamic manner according to the actual conditions of the local housing market.

On one hand, the tax rate is too low compared with other countries. On the other hand, it is not a sufficient way to use a unit tax rate. The differentiated collection of property tax should be also carried out. The preferential tax rate for small-and-medium-sized houses should be increased to optimise the structure of the property market.

Secondly, a long-term regulation mechanism suited to the property market should be built.

Administrative measures such as limitations on the purchase and price of housing should be gradually replaced by market regulations such as taxation and finance. Depending solely on property tax to solve the high housing price and the lack of local finance is not a responsible method. The long-term regulation mechanism should be established by degrees to form a proper economic regulation system.

5.3 Limitations and further researches

In this study, data of property tax and housing prices from 2011 to 2014 in Shanghai City were used. In addition, this research combined qualitative and quantitative methods.

Specifically, a hedonic price model was applied to the study to explain the effect of property tax on housing prices. It was used to broaden the method from a micro level to a macro level. Also, the in-depth interviews of different groups of people to supplement the data made this research more complete, and solved some causation and process problems that emerged during the research.

Nevertheless, the current study still has some disadvantages.

First of all, this is a primary study. Samples are very limited in the qualitative data. It is very difficult to conclude that the results are entirely accurate and representative.

Secondly, using a hedonic model to explore the effect of property tax is a new method for analysing Chinese policy. It is inevitable that this study may make some mistakes when conducting the model.

Thirdly, only four years of monthly data was available. This is not enough to draw a long-term summary. It is not certain that the effect could rise with the increase of tax revenue. More data are required.

Based on the disadvantages above, some suggestions for further studies are given.

Firstly, in order to explore the effect of property tax on the housing prices, at least five years of data, or more, are needed. Only in this way can we further study the long-term effect.

Secondly, important factors such as population, employment and consumption should be included in the model and interviews to obtain a more accurate result.

Thirdly, more samples are necessary for the in-depth interview. Although the current study has four different groups, the samples are not enough because of the limited time available.

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Appendix 1 Hypotheses of the quantitative research

- H₀: Property tax (PT) does not predict the price of residential housing.
- H₁: Property tax (PT) predicts the price of residential housing.
- H₀: Income (INC) does not predict the price of residential housing.
- H₁: Income (INC) predicts the price of residential housing.
- H₀: Building cost (BC) does not predict the price of residential housing.
- H₁: Building cost (BC) predicts the price of residential housing.
- H₀: Consumer Confidence Index (CCI) does not predict the price of residential housing.
- H₁: Consumer Confidence Index (CCI) predicts the price of residential housing.
- H₀: Completed housing (CH) does not predict the price of residential housing.
- H₁: Completed housing (CH) predicts the price of residential housing.
- H₀: Investment (INV) does not predict the price of residential housing.
- H₁: Investment (INV) predicts the price of residential housing.
- H₀: GDP does not predict the price of residential housing.
- H₁: GDP predicts the price of residential housing.
- H₀: Interest Rate (IR) does not predict the price of residential housing.
- H₁: Interest Rate (IR) predicts the price of residential housing.
- H₀: Inflation (INF) does not predict the price of residential housing.
- H₁: Inflation (INF) predicts the price of residential housing.
- H₀: Mortgage Rate (MR) does not predict the price of residential housing.
- H₁: Mortgage Rate (MR) predicts the price of residential housing.
- H₀: Imports and exports (IE) do not predict the price of residential housing.
- H₁: Imports and exports (IE) predict the price of residential housing.

Appendix 2 The standardized residuals of independences

Variable	Minimum	Maximum
PT	-2.474	1.485
INC	-1.979	2.403
BC	-2.583	1.836
CCI	-2.590	1.560
CH	-2.522	1.518
INV	-2.780	1.736
GDP	-2.378	1.884
IR	-1.911	1.650
INF	-2.478	1.680
MR	-1.930	1.670
IE	-2.340	1.603