IHS
Making cities work

IHS is the international institute of urban management
of Erasmus University Rotterdam

MSc Programme in Urban Management and Development

Rotterdam, The Netherlands

September 2015

Thesis

Title: Controlling effects of second-hand housing taxation policies on Wuhan housing market

Name Cen Su

Supervisor: Carlos Morales-Schechinger

Specialization: Urban land development

UMD 11

MASTER'S PROGRAMME IN URBAN MANAGEMENT AND DEVELOPMENT

(October 2014 – September 2015)

Title

Controlling effects of second-hand housing taxation policies on Wuhan housing market

Name

Cen Su

Country

China

Supervisor:

Carlos Morales-Schechinger

UMD 11 Report number:

Rotterdam, September 2015

Summary

Since the housing system reform in 1983, China's housing system has been transformed to the market-oriented supply system. There are two component of the housing system reform, including the improvement of housing market and more affordable housing to everyone. In the aspect about more affordable housing, although since the housing system reform till nowadays, the average housing area is greatly improved, the increasingly expensive housing price prevent those low-middle income people from the housing in the market. And in the aspect about housing market system, both the primary housing market and secondary housing market have been established. The primary housing market is where the transaction of newly built commercial housing is from the developers to the individual buyers. The secondary housing market is where the second-hand housing transfers from one individual seller to another individual buyer. Since the primary housing market and secondary housing market affect each other greatly, the government adjusted the capital gains tax for second-hand housing deals to control the primary housing price by reducing the investment demand in primary housing market.

Based on this background, this research aims to explain the effect of capital gains tax for second-hand housing deals on primary housing prices. This research just focus on the largest city in central China, Wuhan, which has the researching value.

This research is conducted in two aspects and two period. The first aspect is the relationship between the primary housing market and the secondary housing market after the adjustment of capital gains tax in short and long period. The second aspect is to what degree, the capital gains tax can affect the primary housing market price in short and long period.

The main finding in this research is that the 20 percent capital gains tax for secondary housing deals on primary housing price are different in short period and long period. In short period, the capital gains tax can stabilize the primary housing price via reducing the primary housing market demand which is called capitalization effect. However in long period, the effect of capital gains tax on primary housing price is insignificant. The secondary housing price affects the primary housing price most significantly.

This research also proposes some policy recommendations. In policy aspect, more controlling policies on housing market are suggested. Besides, other macro and micro factors should also be paid more attention.

Key Words:

Primary housing market, Secondary housing market, Housing prices, Capital gains tax policy, Capital gains tax effect

Acknowledgement

To begin with, I feel great honour to be a participant of this Master's Programme in the Institute for Housing and Urban Development Studies, Erasmus University Rotterdam.

Meanwhile, the most important thing is to thank my supervisor Mr. Carlos Morales-Schechinger for giving me his professional support and advise during my thesis writing period. If without the guidance from Mr. Carlos, I would say I could not finish my thesis as what it is now. Mr. Carlos is knowledgeable and he is very willing and happy to share all the knowledge with us.

In addition, thanks Mrs. Ore Fika and Luca give me amount of comment and instruction for my thesis. All the comment and instruction are very useful and suggestive.

Last but not least, I thank all the ULD classmates. We share knowledge and information together and we all make progress eventually.

Abbreviations

ADF: Augmented Dickey-Fuller test

CC: construction cost

CGT: capital gains tax

CPI: consumer price index

I: income

IR: bank interest rate

MR: housing mortgage rate

PD: primary housing demand

POP: population

PP: primary housing price

PS: primary housing supply

SD: second-hand housing demand

SP: second-hand housing price

SS: second-hand housing supply

VIF: Variance Infaltion Factor

Exchange rate of USD against RMB (CNY): 1:6.2 (20.03.2015)

Table of content

Summary **3**
Key Words: **3**
Acknowledgement **4**
Abbreviations **5**
Table of content **6**
List of tables **8**
List of Figures 9
List of Formulas 9
Chapter 1: Introduction **10**
1.1 Background 10
1.2 Problem Statement 13
1.3 Research Objectives 15
1.4 Research Questions: 15
1.5 Significance of the study 15
1.6 Scope and limitation 16
Chapter 2 Literature Review **17**
2.1 Introduction 17
2.2 Housing market 17
2.2.1 Housing market theory 17
2.2.2 Housing demand 19
2.3 Capital Gains Tax 21
2.3.1 What is capital gains tax? 21
2.3.2 Capital Gains Tax and other taxes 24
2.4 Land value capture 25
2.4.1 Land value capture in the world 25
2.4.2 Land leasing and land value capture 25
2.4.3 Capital Gains Tax and land value capture 26
2.5 Capital gains taxation policy and its outcomes in housing market 26
3. Conceptual framework 27
Chapter 3 Methodology **29**
3.1 Revised Research Question(s) 29
3.2 Operationalization: Variables, Indicators 29
3.2.1 Housing market relationship with the effect of capital gains tax 29
3.2.2 To what degree, capital gains tax affect the primary housing prices 30
3.2.3 Capital gains tax operation 31
3.3 Data Collection Methods 32
3.4 Sample size and selection 34
3.5 Validity and Reliability 35
3.5.1 Validity: 35
3.5.2 Reliability: 35

3.6 Data Analysis Methods 36
Chapter 4 Data analysis 39
4.1 The relationship between capital gains tax and primary and secondary housing market in Wuhan 39
4.1.1 Modelling introduction and data selection 39
4.1.2 The Granger Causality Test for the short testing period 40
4.1.3 The Granger Causality Test for the long testing period 44
4.2 The analysis of primary housing market price determining factors 49
4.2.1 The empirical panel data regression analysis for short period 50
4.2.2 The empirical panel data regression analysis for short period 53
4.3 Conclusion and explanation 55
4.3.1 Explanation about why capital gains tax can affect primary housing market in short period 55
4.3.2 Explanation about why capital gains tax cannot affect primary housing market in long period 57
Chapter 5 Conclusion and recommendation 61
5.1 Retrospect 61
5.2 Conclusions 61
5.2.1 The short and long period different effect of capital gains tax on primary housing price 61
5.2.2 The capitalization effect theory effect explaining the short period result 62
5.2.3 The housing market theory explaining the long period result 62
5.3 Answer to research question 62
5.3.1 The answer of sub-question 1 62
5.3.2 The answer of sub-question 2 63
5.3.3 The answer of sub-question 3 63
5.4 Recommendations 63
5.4.1 Political recommendations 63
5.4.2 Further research recommendations 63
References: 65
Annex 1 the result of questionnaire 69
Annex 2 The panel data regression result from 26 months to 3 months 71
Annex 3 The result of unit root test for panel data regression 76
Annex 4 The result of VIF test 78

List of tables

Table 1 Phase of the housing reform in China (Source: Wang, 2012, Deng and Wang, 2011) 10

Table 2 The transaction relationship in primary and secondary housing markets (Source: the author) 12

Table 3 the details of capital gains tax (Source: the author based on the regulations) 14

Table 4 The capital gains tax in UK from 2013 (Source: Khan, 2013) 22

Table 5 The capital gains tax in US from 2013 (Source: Khan, 2013) 23

Table 6 The capital gains tax in Australia from 2013 (Source: Khan, 2013) 23

Table 7 Details of Variables about housing market performance (Source: the author) 30

Table 8 Details of Variables about other determining factors of primary housing prices (Source: the author) 31

Table 9 Details of Variables about capital gains tax (Source: the author) 32

Table 10 Data collection methods (Source: the author) 33

Table 11 Time framework (Source: the author) 34

Table 12 Abbreviation and explanation of variables in Granger Causality Test (Source: the author) 36

Table 13 Abbreviation and explanation of determining primary housing prices factors (Source: the author) 38

Table 14 the upgraded variable list of Granger Causality Test (Source: the author) 40

Table 15 the result of AFD test for short testing period (Source: the author based on Eviews) 41

Table 16 the unit root test of the residual value series of the least square regression model among LCGT1, LSP1, and LSD1 (Source: the author based on Eviews) 42

Table 17 the result of Granger Causality Test for short period (Source: the author based on Eviews) 43

Table 18 the result of AFD test for short testing period (Source: the author based on Eviews) 45

Table 19 the result of the Johansen Co-integration Test among LCGT2, LSP2, LSS2, LSD2, LPP2, LPD2, and LPS2 (Source: the author based on Eviews) 46

Table 20 The best lag selection by the different criterion (Source: the author based on Eviews) 47

Table 21 the result of Granger Causality Test for long period (Source: the author based on Eviews) 48

Table 22 the list of dependent and independent variables of panel data regression (Source: the author) 49

Table 23 the result of F statistic value test (Source: the author based on Eviews) 51

Table 24 the result of fixed effect regression model for short period (Source: the author based on Eviews) 52

Table 25 the result of fixed effect regression model for long period (Source: the author based on Eviews) 54

Table 26 The panel data regression result from 26 months to 22 months (Source: the author based on Eviews) 71

Table 27 The panel data regression result from 21 months to 17 months (Source: the author based on Eviews) 72

Table 28 The panel data regression result from 16 months to 12 months (Source: the author based on Eviews) 73

Table 29 The panel data regression result from 11 months to 7 months (Source: the author based on Eviews) 74

Table 30 The panel data regression result from 6 months to 3 months (Source: the author based on Eviews) 75

Table 31 The result of unit root test in short period (Source: the author based on Eviews) 76

Table 32 The result of unit root test in long period (Source: the author based on Eviews) 77

Table 33 the result of VIF test in short period (Source: the author based on Eviews) 78

Table 34 the result of VIF test in long period (Source: the author based on Eviews) 78

List of Figures

Figure 1 The consumer structure of housing market (Source: Newell, et al., 2005) 20

Figure 2 The conceptual framework (Source: the author) 28

Figure 3 The map of Wuhan (Source: the author based on Google map) 37

Figure 4 inverse roots of AR characteristic Polynomial 47

Figure 5 the average capital gains tax amount of second-hand housing deals in every district of Wuhan in short period and long period comparison (Source: Municipal Bureau of Local Taxation, 2015) 58

Figure 6 the secondary housing prices in every district of Wuhan from February 2013 (Source: secondary data from China Index Academy) 58

Figure 7 the secondary housing demand in every district of Wuhan from February 2013 (Source: secondary data from China Index Academy) 58

List of Formulas

Formula 1 The general formula of Granger Causality Test (Source: Gao, 2005) 36

Formula 2 The general formula of panel data regression (Source: Gao, 2005) 38

Formula 3 The specific formula of panel data regression (Source: the author based on Gao, 2009) 49

Chapter 1: Introduction

In 1983, housing system reform started in China. Since then, primary and secondary housing markets have been formulated. Because of housing system reform, living conditions and living areas have greatly improved. Unfortunately, a drawback to the housing reform system was that the housing prices became so expensive that low- and middle-income people cannot afford housing in urban areas. To solve this problem, the national government issued a series of policies to control the housing market. The capital gains tax for second-hand housing deals is one of the targets of those policies.

This chapter will introduce the research background, the research subjective (i.e. the capital gains tax), the research objective and will pose questions for future investigation.

1.1 Background

The reform of China's urban housing system

To study the secondary housing market in China, it is very important to review the housing reform and its effects after 1983. In 1983, China converted the government and state distributed housing system to a market-oriented housing supply system through the housing reform (Wang, 2000). The main purpose of this reform was to grant urban citizens access to the urban housing market. This resulted in the emergence and prosperity of the real estate market. This reform can be divided into three phases.

Table 1 Phase of the housing reform in China (Source: Wang, 2012, Deng and Wang, 2011)

1986 - 1998	China's first national land use regulation law was adopted in 1986. Residential housing allocation through public work units was canceled and the monetization of housing allocation was implemented in several pilot cities. During this period, the sale of public housing was the main goal in several pilot cities. In addition, in 1986 the State Council set up a leading group to reform the housing system by putting forward rent subsidies as a basic part of the housing system reform.
1998 - 2003	Monetization of housing allocation was implemented throughout China. At the same time, a multi-level urban housing supply system was established. It included housing finance, credit, and a new market transaction system. From 1998, the *Danwei*[1] was encouraged to fund its staff with monetary subsidies, rather than building or purchasing new housing for its staff. This way, employees could buy housing from the housing market. This marked the beginning of the privatization of urban citizens' means of livelihood.
2003 – Now	Measures of market regulation were used to control and stabilize the housing price and the balance of supply and demand of the housing market. Beginning in 2003, investment in the real estate market overheated in several regions. Housing prices increased rapidly. Especially in Shanghai and Hangzhou, housing prices increased by more than 10%. Therefore, for this period, market regulations were implemented to stabilize housing prices.

[1] Danwei means the working place and organization. In the past, it was usually the state-owned enterprises. Denwei was the actor which allocated housing to its staff.

The real estate market tends to mature along with housing reform. A multi-level housing market has already been established. The effect of housing reform has been remarkable. Compared to the initial objective of increasing housing supply and production (Wang, 2012), the reform archived its goals greatly. First, the living conditions and housing standards have been improved. This contributes to social stability. According to data from China Family Panel Studies, by the end of 2012, the average per capita living space of urban residents was 33.5m2. In 1978, it was only 3.6 m2 (The Institute of Social Science Survey of Peking University, 2012). Living conditions have also been changed. Rather than simply having a place to live, most urban citizens live in a comfortable place. Second, the housing market has played an important role when residents have demanded housing. Nowadays, most Chinese urban housing transactions are carried out through the housing market. This shows that the market greatly affects housing allocation instead of the public distribution system. Third, the real estate industry and such related industries as construction and financial credit developed rapidly and made important contributions to national economic growth. From 2004 to 2013, national real estate investment accounted for 18% to 22% of the whole society's investment (National Bureau of Statistics of China, 2014). This shows that the real estate industry has become an important part of the national economy.

In spite of the fact that great achievements have been made and certain goals have been reached, there are still serious problems about the current real estate market. To begin with, the housing price is too high for ordinary consumers to afford (Wang, 2012). For example, according the data from the CSSB, the average housing area for a single person is 33.5 square meters in 2012. Since the annually average income of employed persons in urban units is USD 4,347, the housing price to income ratio is 7.3. This is higher than the international standard level of 6 to 7[2] (Hulchanski, 1995). Second, the primary and secondary housing market developed out of balance. Generally speaking, a mature real estate market should include a primary market, a secondary market and a renting market. As the main transaction content of the housing market, commercialized residential housing accounts for 65 percent of the market share rate (Wang, 2012). Thus, a well-functioned primary housing market is greatly related to the development of the entire housing market.

The secondary housing market

To understand what the secondary housing market is, it is essential to clarify the meaning of second-hand house.

First, a second-hand house is different from a second-home house. A second-home house is an extra property which can be used by the family themselves, rented to someone else, or just kept vacant. Conversely, a second-hand house is a house that is already owned by an individual, not agency or developer. In other words, it is a used home that is for sale. A second-hand house can be a family's second-home if the family intends to sell it. Therefore, the secondary housing market is where property owners transfer their ownership to others and where the trading relationships of property ownership is between individual buyers and sellers.

Second, the second-hand housing market is different from the primary housing market. In the primary housing market, newly built residential housing is sold. In the secondary housing market, used housing is sold. Thus, the second-hand housing market is commonly known as

[2] The average wage of employed persons in urban units (yuan) is 26955 in 2012. The average selling price of commercialized residential (yuan/m^2) is 5611 in 2012 (National Bureau of Statistics of China, 2014). Besides, Exchange rate of USD against RMB (CNY): 1:6.2 (20.03.2015)

the secondary housing market. In addition, the primary housing market and the secondary housing market both belong to the housing market.

Table 2 The transaction relationship in primary and secondary housing markets (Source: the author)

	Supply side	Demand side
Primary housing market	Developer	Individual consumer
	Developer	Individual investor
Secondary housing market	Individual investor	Another individual consumer
	Individual consumer	Another individual consumer

The second-hand housing market in China emerged in 1999. The Ministry of Construction issued a policy regarding "The regulation of second hand housing and affordable housing for sale" in April of 1999. This policy permitted institution of the secondary housing market in China.

Although it has been developing for more than ten years, the secondary housing market in China is still in an initial phase. The trading volume of the secondary housing market is significantly lower than that of the primary housing market (Hou, 2011). In addition, the relevant financial support services are inadequate. Generally, the vast majority of second-hand housing consumers are from low-or lower-middle-income groups. They can only meet their housing demand through the secondary housing market. Even though they can access this market, the high market values of those second hand houses make it difficult for them to finish the lump-sum payment. However, the vast majority of mortgages are still focused on the primary market. When commercialized banks intervene the secondary housing market, they have to face very high risks of long repayment periods and high operating costs in China. This is especially true when one compares secondary housing mortgages with those of the primary housing market.

The secondary housing market in the city of Wuhan

Wuhan is the capital city of Hubei Province in the central China and has a population of about 10.22 million (National Bureau of Statistics of China, 2014). Wuhan is the political, financial, cultural, educational and transportation center of central China not only because it is the most important industrial and manufacturing production base in the whole country, but also because it is a major transportation hub. Dozens of railways, roads and expressways pass through the city. Thus the social and economic phenomena in Wuhan have significant meaning to the city itself and to regional and national development.

In 1992, in the first phase of housing reform, urban housing reform started in Wuhan. With the development of housing system reform, the real estate industry in Wuhan developed at an accelerated rate. Investments in the real estate industry increased from USD 0.8 billion in 1992 to USD 307.5 billion in 2012; this represented a 38275% increase [3](National Bureau of Statistics of China, 2014). The built-up residential floor area increased from 0.91 million m2 in 1992 to 625.74 million m2 in 2013; this was a 68662% increase (National Bureau of Statistics of China, 2014). The population increased from 1.17 billion in 1992 to 1.36 billion

[3] Exchange rate of USD against RMB (CNY): 1:6.2 (20.03.2015). The below is the same.

in 2013; this was a 16% increase (National Bureau of Statistics of China, 2014). Relevant industries such as housing agencies and property management developed rapidly. The transaction volume increased greatly. The housing industry has become an important industry in Wuhan. However, Wuhan is facing the same problem of high housing prices as other cities are. In 2012, the average selling price of commercialized residential buildings was USD 1,112 per m2. Due to fact that the annual average income of urban citizens was USD 4364 and the average housing area for a single person in 2012 was 33.5 square meters, the housing price to income ratio was 8.54; this is even higher than the national level of 7.3 (National Bureau of Statistics of China, 2014).

The secondary housing market in Wuhan has also developed over the past 20 years. There are lots of second-hand housing options in the Wuhan housing market. This has provided a multi-level housing supply to consumers. In addition, with the scale of commercialized housing increasing every year, the secondary stock market also increased steadily over the past 20 years (Cao and Yang, 2008). In conclusion, the secondary housing market provides a precondition of this study.

1.2 Problem Statement

If one depends solely on the market mechanism, it is difficult to fulfil the target of optimal allocation of housing stock resources. The housing market needs government intervention and control. Taxation is a powerful way for the government to control the secondary housing market (Yamarik and Ijede, 2012). As a result, the Chinese national government issued a series of policies to control the housing market. The capital gains tax is one of the policies introduced during the third phase of the housing reform in China.

The capital gains tax is regulated as a part of personal income tax according to the Individual Income Tax Law of the People's Republic of China rules for its implementation (1994), which was established in 1994. In the individual income tax law, individual property assignment includes real estate and requires individuals to pay 20% of the profits from the sale of their personal property[4], which is the capital gains tax in other countries.

Then, in 2006, the implementation details were regulated (China State Administration of Taxation, 2006). There were two different ways to pay the capital gains component of the income tax.

1) Pay 20% of the profits resulting from the second-hand housing deal if the house sellers can provide the original purchasing invoice.
2) Taking into account the fact that most house sellers cannot keep the original purchasing invoice, the capital gains tax is only 1% to 3% of the total income from selling the second-hand house.

Due to the booming real estate market in recent years, housing prices have increased rapidly. Second-hand housing sellers prefer to take the second way to pay the capital gains tax; often, they will pretend that the original purchasing vouchers are missing in order to take advantage of its greatly reduced tax rate (Zhang and Wang, 2014).

In order to regulate taxation, in February 2013, the Standing Committee of the State Council revised the implementation of the capital gains tax regulation on second-hand housing deals in National 5 Regulations. In the regulations, 20% of the profits resulting from the second-

[4] Personal property: including other capital assets, not only housing.

hand housing deals should be paid as capital gains component of income taxes. The details are in table 3.

Table 3 the details of capital gains tax (Source: the author based on the regulations)

Items	Rules in 2013	Rules in 2006
Tax payers	The second house sellers	The same as rules in 2013
Tax exemption	a) Second-hand house is older than five years. b) The house is the only property of the family. c) Only can the tax be free, when the two conditions are fulfilled at the same time.	The same as rules in 2013
Tax base	The profits resulting from the second-hand housing deals	The total selling price of second-hand housing
Tax rate	20%	1% - 3%
Calculation Example	The value of a house (100 m2) which was purchased in 2003 was 30,000 USD. Ten years later, the value increased to 114,900 USD. With the original purchase invoice: (114,900 – 30,000) * 20% = 16,980 USD	The value of a house (100 m2) which was purchased in 2003 was 30,000 USD. Ten years later, the value increased to 114,900 USD. Without the original purchase invoice: 114,900 * 1% = 1,149 USD, to 114,900*3% = 3,447 USD

The latest revision addresses two aspects: a) this tax should be implemented strictly. The tax rate cannot be changed into the other option for any reason, even if the sellers cannot provide the original purchasing invoice. This means that individuals will no longer be able to avoid the tax by pretending that the original purchasing invoice is missing. b) This tax cannot be transferred to or shared with the buyers. Only the sellers have to pay it.

The main purpose of this strong tax is to allow the government to control the real estate market effectively (Zhong, 2012). Based on this tax, in a short term, second hand housing owners would be concerned about the heavy tax in the future and so they would want to sell their property as soon as possible. Therefore, the primary housing price will be stabilized. Moreover, it will increase the cost of investment in the long term after five years and it can also restrain investment in the housing market. This will contribute to the public good (Smolka, 2013) because the housing prices will be pushed down with the capital gains tax.

1.3 Research Objectives

This research will focus on explaining the effectiveness of the new second-hand housing individual income tax on stabilizing primary housing prices and making housing more affordable in the city of Wuhan during recent years.

The principle objective of this research is to explain the effectiveness of the second-hand housing capital gains tax as an instrument for the short-term and long-term stability of housing market.

Therefore, the specific objectives of this study are as follows:

To identify the direct influence of the second-hand housing capital gains component of the income tax on the secondary housing market;

To identify the indirect influence of the second-hand housing capital gains component of the income tax on stabilizing property price of the primary market;

1.4 Research Questions:

According to the problem statement and research objective, the main research question is:

How does the 20 percent capital gains component of the income tax for secondary housing deals affect the stability of primary housing prices in Wuhan from 2013?

To answer the main question, there are several sub-questions of this study:

1. What is the relationship between primary and secondary housing markets in Wuhan after the adjustment of the capital gains tax from March 2013 to June 2015?
2. To what degree did the capital gains tax affect the primary housing price in Wuhan from February 2013 to March 2015?
3. How does the capital gains tax operate in Wuhan?

1.5 Significance of the study

Academic Relevance

When someone purchases a house, he or she also purchases parts of the bundle of rights belonging to the land. When the local government collects revenue via this capital gains tax on second-hand housing deals, it captures the land value as well as the value of buildings and eventually redistributes it to public services.

This research contributes to the literature on land value capture. Since the capital gains tax is expected to reduce speculation in the housing market and stabilize the housing prices, then land value capture is expected. Yet it will have the effect of making housing more affordable and therefore this research about capital gains tax will contribute to the social good, which is the purpose of land value capture (Smolka, 2013).

Practical Field Relevance

The finding of this research can explain the operation of the primary and secondary housing markets after the adjustment of this tax. It can make the housing taxation policy more complete.

1.6 Scope and limitation

This study consists of five chapters. The first chapter introduces the capital gains taxation policy in the context of the city of Wuhan. The second chapter reviews the relevant academic literature. The third chapter explains the specific methodology of this research. The forth chapter analyzes the effect of capital gains taxation policy on the Wuhan housing market. The concluding chapter discusses all the findings and results and offers recommendations relating to both political actions and future research.

The limitations of this study are as follows:

1. It is difficult to include all the effects of other interference factors such the restriction of third-home purchasing or macroeconomic factors.
2. Since the capital gains tax was adjusted in February 2013, it has been implemented for only two years. The implementation time is very brief.
3. The data processing for the model might distort the result of the model but this cannot be avoided. For example, data about population income remain the same for the whole year.

Chapter 2 Literature Review

2.1 Introduction

Land is the foundation of a city and even a nation. How to issue land policies and implement land instruments has always been one of the main topics of academic debate. Land value taxation as an important land instrument is a topic that has been put under the spotlight more and more. Through the economic, financial and public administrative theories and methods, land experts study and explain the effects of land value taxation on land value capture and public goods redistribution. This forms the theoretical foundation of land management for governments world-wide.

As a result, this chapter attempts to summarize and sort out the main academic contributors' opinions and arguments about land value taxation (especially about capital gains taxes) in order to have a better understanding about the nature of land value capture.

Specifically, as a kind of taxation instrument, what is a capital gains tax from the point of its formulation, development and transition? How do capital gains taxes capture land value? How does a capital gains tax affect the housing market's demand and supply relationship? These questions are investigated in this study.

This literature review chapter will be organized based on the above three questions. The first part will explain the basic theory of housing markets. The second part will introduce the theory about the capital gains tax. The third part will introduce the debate about whether or not capital gains taxes are means of capturing land values. The last part will analyse and compare the primary and secondary housing markets and the effect of capital gains policy on the housing market.

2.2 Housing market

2.2.1 Housing market theory

Primary housing market and Secondary housing market

The concept of primary market and secondary market was originally used for financial markets. When it applied to the real estate market, it has a different meaning. Primary and secondary housing markets are divided based on the condition of houses being either new or used (Deng and Song, 2008).

A primary housing market is one where the trade of new houses takes place. Kwoun, et al. (2013) argued that the primary housing market is the market of unsold new housing stocks. Deng and Song (2008) held the view that only the houses sold by developers are the commodities in the primary housing market.

The secondary housing market is the opposite concept to the primary housing market. It is also called the second hand housing market or the stock housing market. It is the market for stock housing deals. Stock housing is the existing entity at a certain point in time and it mainly refers to used housing that has been built and sold (Deng and Song, 2008). In other words, it is the house of which the ownership belongs to an entity other than developers; such owners include private companies and individuals. In brief, once stock housing is sold, it becomes second-hand housing.

Relationships between secondary housing market and primary housing market

Ge and Xu (2007) examined the relationship between the second-hand housing market and the primary housing market[5]. The demand for second-hand housing determines the second-hand housing prices. Second-hand housing prices influence the prices of built housing which, in turn, affects the supply of newly built housing. The second-hand housing prices have a positive correlation with the supply of newly built housing. The second-hand housing price is the reason for changes in newly built housing prices.

Duffy et al (2005) stated that second-hand housing prices have an obvious impact on the prediction of primary housing market prices.

Liu and Zhao (2012) concluded that the primary housing market prices are higher than secondary housing market prices in similar locations and physical conditions. When primary housing market prices increase, then secondary housing market prices increase at the same time. When the price gap between the primary and secondary housing markets is too wide, then the price of the secondary housing market increases. Conversely, when the gap is too narrow, the price of the primary housing market increases.

Li and Song (2009) explained that the housing price and trade volume are based on Dynamic Stock-Flow Model. When there are external factors affecting the housing market, the price and trading volume change dramatically. When external factors are positive to the secondary housing market, then the demand becomes larger than the supply.

In conclusion, the supply amount and the primary housing market prices determine the secondary housing supply and structure. The secondary housing market promotes the primary housing market to complement the equality of the primary housing market. Thus, without the secondary housing market, the primary housing cannot develop well.

Determining factors on residential housing market

According to economic theory, the housing market price is determined by supply and demand. In fact, the residential housing price is determined by market mechanisms but also by other factors.

Hwang and Quigley (2010) designed a demand-supply model to investigate housing prices in 73 US cities from 1987 to 1999. They concluded that the vacancy rate is the most significant determining factor of housing prices. When there is high vacancy rate in the housing market, the housing prices decrease. Thus, if the vacancy rate was high last year, then homeowners could expect a lower housing price this year. In addition, the entire economic environment, family income and unemployment rate also affect housing prices (Hwang and Quigley, 2010).

Indeed, be it temporary or long-term, income is a very important determining factor for local housing prices (Meen, 2011). Meen observed housing prices in Great Britain and United America and found that income has a significant impact on housing prices, especially long-term income. Also, Gallin (2006) thought that income and population determine the long-run equilibrium price.

Zhu et al (2013) explored potential differences in local real estate prices for 20 US cities. Zhu used panel data to analyze the information from the 20 US local markets to identify the spillover effects over the local housing market. They found that population, unemployment,

[5] This research by Ge and Xu extended the Four-quadrant Model of Denise and William.

per-capita income and mortgage rates are statistically significant determinants of housing prices in local markets.

Shiller (2005) stated that house prices were rising much faster than expected, given the observed changes in such underlying, or foundational, socio-economic measures as income, population, long-term interest rates and building costs over the last decade.

Land prices are also an oft-debated determining factor for housing prices. Kuang (2005) examined the impacts of the site-scale of real estate developers, vacant land ratio and Floor Area Rate on housing pricing, land pricing and explored the relationship between them. Housing prices and land prices are increasingly functions of vacant land ratios. The correlation between housing price and land price is negative when there exists an excessive supply of land.
Taxes and fees are also significant determining factors (Sun, 2010).

2.2.2 Housing demand

Housing demand of new households and migrants

The demand of new households can be explained from different points of view.

Masnick (2002) used the life-cycle theory to examine the relationship between housing demand and age. For young adults, the housing demand is lower. This is because they have a low income and they do not have to worry about family problems. They prefer to rent residences. Individuals in middle age groups form whole families including children as they age. Thus, they need more space to live in. In addition, affordability increases because they earn higher incomes. Thus they have the highest housing demand. As their ages increase, the children leave their families and their housing demand declines.

Guo and Hardin (2014) state that wealth is the determining factor to new households' housing demand. Salary income and other forms of income like capital assets are the two compositions. Firstly, income determines the housing demand. Low-income families prefer smaller housing options because of their lower ability to pay. Secondly, families with a high net value of capital assets ignore the influence of low income. Their housing consumption pattern is still aimed at seeking larger housing options.

In conclusion, the income or the wealth of a household is the basic determining factor for making housing purchasing decisions. Other factors, such as life period, will also have an effect on housing demand, especially for individuals in elder groups.

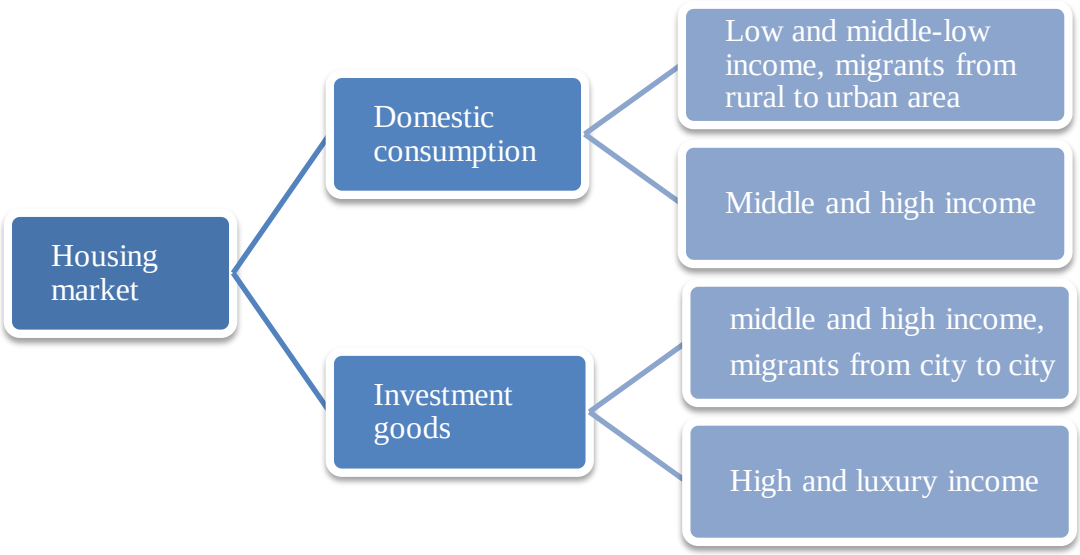
As a result of the Hukou system, floating population is the main form of migrants. There are two groups of floating populations: (a) from rural areas to urban areas and (b) intercity floating populations.

The first group usually consists of low-income people whose jobs are difficult and demanding, such as constructing workers (Shen, 2002). Their housing demand is more focused on domestic consumption.

The second group is usually composed of individuals from middle- or high-income groups. They have spare money to purchase more than one house. Their housing demand is based on investment goods rather than on living demand (Cook, et al., 2013).

As described above, the structure of the housing market can be concluded as the figure 1.

Figure 1 The consumer structure of housing market (Source: Newell, et al., 2005)



Second-home ownership

Second-home ownership is common in the world. In the West, second-home consumption is mostly used for leisure or recreational activities (Hong and Yi, 2012). London, Barcelona, and many other tourist destination cities are representative locations of this trend (Francese, 2003). Investment is another important factor that motivates second-home owners to make their purchasing decisions. It is particularly common among middle-aged and old people with relatively higher incomes.

However, the situation in China is quite different. For institution and socialist legacy reasons, leisure and recreational motivations are not the domain choices for second-home owners in Chinese cities. According to Hong and Yi's analysis, there are several reasons why Chinese second-home ownership is different from that in the West. First, because of the emerging housing market in China, affordability became one important factor that motivated second-home owners to purchase a second-home. As is similar to the situation in the West, older people with higher incomes tend to purchase second-homes. Second, housing allocation reform is the most important reason why households own second homes. People can now access commodity residential housing freely in the market. Third, to a certain extent, the Hukou system resulted in second-home ownership. Normally, migrants with Hukou registered elsewhere live in housing in the cities where they work; meanwhile, they have another house in their hometown cities where they Hukou registered. Additionally, they have to register their Hukou using an address so they are not allowed to sell their hometown housing to generate income. Last, the provision of public goods like education and health care is different among neighbourhoods even for those in the same city. As a result, Chinese households tend to purchase second homes in neighbourhoods that offer better education or health care services (Hong and Yi, 2012).

Second-hand seller's motivation

According to Zhang and Wang's research, there are four types of second-hand housing sellers (Zhang and Wang, 2014):

a) Individuals needing money urgently: This type of second-hand housing seller usually lacks money because of an accident or poor business cash flow. They have to sell their house to obtain money because they cannot obtain adequate money from banks in such a short period.

b) Individuals seeking to improve their quality of life: These types of families usually hope to move to a larger house or to better located housing. They do so due to the growth of children, living with elders or just simply to improve their housing quality.

c) Professional speculators: They are good at housing speculation. They know how the housing market operates very well. They hope to obtain huge profits as the housing price increases. They are very sensitive to housing policies.

d) Normal Investors: They do not live on speculation but they have several pieces of real estate in hand. They usually sell second-hand housing for a higher price than the market price because they do not need money.

2.3 Capital Gains Tax

2.3.1 What is capital gains tax?

A capital gains tax is a type of income tax on the profits resulting from the sale of capital assets (Walters, 2012). Sellers should pay a tax for their capital gains when the value of the sold capital assets is higher than the previous purchase price.

The purpose of capital gains tax

In order to examine the efficiency and effectiveness of a capital gains tax on secondary housing market prices, it is very important to understand the purpose of a capital gains tax.

When talking about capital gains tax reform in Great Britain, Adam stated that the purposes of capital gains tax are: 1) redistributing the ownership of capital assets, 2) encouraging investments on one's own business rather than on a second home or more assets, 3) remedying limitations of other taxations' tax base, 4) encouraging savings and investments at a reasonable tax rates (Adam, 2008).

Nathan (2011) similarly argued that the purpose of capital gains tax is about the allocation of capital assets and the period of ownership. She stated that the purpose of capital gains tax is to restrain speculation on the market. Capital gains tax rates are relatively high for short-term investment periods; a period of less than one year, for example, might have a tax rate of up to 39.6% in United States. Nathan differentiated between speculation and investment through the ownership period. She thought that, broadly speaking, short term capital gains tend to be speculative because investors expect an investment return in a short period of time rather than waiting for several years. Under this circumstance, a capital gains tax is more like a punishment for short-term investors.

Taxpayer

Individuals and companies are the taxpayers of capital gains taxes (Khan, 2013). However, in Great Britain, limited companies are not required to pay the capital gains tax, although they do have to pay turnover tax on whatever profit they make. Only private land sellers are capital gains taxpayers, be they individuals or companies.

Tax base

Capital assets mainly refer to three areas: real estate, stocks and company assets (Khan, 2013). One main body of personal property is real estate, which consists of land and buildings. Since land and buildings are quite frequently for sale on the market and since their value is relatively high, the capital gains tax is a main source of government revenue collection and fiscal policy (Pietola, et al., 2012).

Capital gains resulting from the sale of capital assets are unearned increments or windfalls, such as those stemming from investments in urban infrastructure (Smolka, 2013). No value

increments resulting from the direct consumption of labour, capital or technology on the capital assets are considered to be capital gains. The capital gains tax base should be restricted to capital assets that have values that depend on the floating price of capital assets.

Tax levy methods

Throughout the countries with capital gains taxes, there are mainly three capital gains tax levy methods.

The first one is levying a capital gains tax separately. It is common in Great Britain, Hungary, Japan, Poland, Australia and Finland. In those countries, capital gains taxes are a separate taxation type apart from the income taxation system.

The second method is levying a capital gains tax with the income tax. The capital gains tax rate is influenced by the income tax rate. For example, in the United States, if the taxpayer belongs to a group with an income tax rate of 15%, then the capital gains tax rate is half of the original capital gains tax rate. This is shown in Table 4.

The third method is making capital gains tax a part of the income tax. There is no separate capital gains tax in countries like Brazil, Chile, Argentina, Mexico, Korea and China. Even though the tax is levied on capital assets transfer, the tax is still an income tax. In fact, the nature of this kind of income tax on capital assets transfer is actually a capital gains tax. The reason is that this kind of income tax is not charged on periodic income; rather, it is charged on the one-time value increment when transfers take place (Khan, 2013).

Tax rate

Capital gains taxes are assessed at different rates according to three methods (Khan, 2013).

The first tax rate method is a relatively fixed tax rate that changes with different profits. In this case, the tax rate varies with the value of the profit but the tax rate is fixed for each tax base level. Great Britain is the most typical example of a country that uses this design principle. In Great Britain, all forms of individual capital asset transfers are the tax bases. The tax rate in Great Britain is as below.

Table 4 The capital gains tax in UK from 2013 (Source: Khan, 2013)

The value of profit	Tax rate
£0 - £1880	10%
£1881 - £29400	22%
£29401 and over	40%

The second tax rate method is fixed tax rate changes based on the ownership period. Most countries adopt this principle to charge the capital gains tax. Here, the tax rate is based on the ownership period of the capital asset. For example, in the United States, ownership longer than one year is viewed as being middle-term possession and ownership longer than five years is viewed as being long-term possession. And the tax rate is designed as below.

Table 5 The capital gains tax in US from 2013 (Source: Khan, 2013)

Income tax rate	Short-term capital gains tax rate	Middle-term capital gains tax rate (1 year)	Long-term capital gains tax rate (5 years)
15%	15%	10%	8%
28%	28%	20%	18%
31%	31%	20%	18%
36%	36%	20%	18%
39.6%	39.6%	20%	18%

The third tax rate method is the marginal rate system, for example, Australia uses this system. The details of the tax rate in Australia are shown as table 6 below.

Table 6 The capital gains tax in Australia from 2013 (Source: Khan, 2013)

The value of profit	Tax rate	Calculation (X is the profit of transaction)
0-$18,200	0%	$0
$18,201 - $37,000	Over $18,200, 19%	$0+19%*X
$37,001 - $80,000	Over $37,000, 32.5%	$0+19%*18,200+32.5%*(X-18,200)
$80,001 - $180,000	Over $80,000, 37%	$0+19%*18,200+32.5%*(37,000-18,200)+37%*(X-37,000)
$180,001 and over	Over $180,000, 45%	$0+19%*18,200+32.5%*(37,000-18,200)+37%*(180,000-80,000)+45%*(X-180,000)

Tax exemption

In order to facilitate the equality and efficiency of the capital market, tax exemptions are necessary for every country. Figure 1 is the main exemptions for capital gains tax (Khan, 2013): 1) The only residence, 2) Transfers between legal couple or partner, 3) Value decreasing assets, 4) Compensations, gifts, prizes or assurances.

2.3.2 Capital Gains Tax and other taxes

Although the capital gains tax has been discussed above, there are some taxes similar to the capital gains tax. The discussion below tries to clarify the differences between a capital gains tax and other taxes.

The differences between a capital gains tax and an income tax

Capital gains and operating income are both produced in the capital operation context, but there are some differences between them. Operating income results from substantial production factors like technology and labour after the continuously operating progress of producing and selling. On the contrary, capital gains are produced by the sale of capital assets. Capital gains do not depend on production. Instead, they depend on the floating prices of the capital assets.

Based on the understanding of capital gains and operating income, the income tax is charged periodically based on periodical operating income; the capital gains tax is charged once based on the profits resulting from capital assets transfers (Hou, 2011).

The differences between capital gains tax and transfer tax

A transfer tax is charged when the land or building is legally transferred to a different party (Walters, 2012).

The main difference between capital gains taxes and transfer taxes is that the tax base of transfer taxes is the total value of transferred land or buildings. However, the capital gains tax is charged based on the value increment of the profit gained in the transfer.

Another difference is the taxpayer. For a capital gains tax, the taxpayer is a capital asset seller. For a transfer tax, the taxpayer is the capital asset buyer.

In most cases, the capital gains tax and transfer tax can exist at the same time.

The differences between capital gains tax and property tax

A property tax is levied on the property and helps the government to capture the total value of the property instead of just the increment (Walters, 2012).

As a capital gains tax is different from a property tax, it is charged once and it is levied on the profits resulting from capital assets transfers. It is unlike a property tax that is levied on the total value of the real estate.

The differences between capital gains taxes and value-added taxes

A value-added tax is assessed on the commodities that can be used as inputs to increase the commodity sales value from the manufacturing stage to other service stages (Ebrill, 2001).

The most significant difference is the tax base. For value-added taxes, the tax is based on the increasing value of products, material, and services when transactions take place. Similar but different, capital gains taxes are based on value increments of capital assets like real estate and stocks. Finally, the value-added tax is based on the increase in value due to labour and technology and not on a floating value in the market.

2.4 Land value capture

2.4.1 Land value capture in the world

Urban Land value

When we talk about land value capture, it is essential to clarify the components of urban land value. Hong and Brubaker (2010) state that urban land value has four components including: a) Improvement in public infrastructure and social services; b) Land use planning changes; c) Social and economic development; d) Landowner's investment.

According to this definition, urban land value consists of two aspects, a landowner's efforts and collective actions. The former is the private investment on land and productive action on land. The later aspect includes public infrastructure and social services, land use planning changes, and socio-economic development.

Land value capture

Although both private and public actions can increase the value of real estate, the public authority should only capture the land value increments caused by public collective actions. This is because the value increment resulted from private investment. The land's productivity is the result of the landowner's efforts. If the local authority tried to expropriate all of the private landowners' gains it would eliminate their enthusiasm for investing in their private land and property (Fainstein, S., 2012). In other words, when we discuss land value capture, we discourage capturing all the land value. Only the residual value of land should be captured. Residual value is the entire value of the real estate property less all the transport and production costs.

Thus capturing land value only relates to land value increment from public investments and administrative actions (Smolka, 2013). All of the land value increments resulted from administrative actions like land planning or zoning changes and public investments like infrastructure, amenities and social services. Population growth with social-economic development should be shared by all the citizens in a city, rather than by a private entity (Fainstein, S., 2012).

It is unclear whether the purpose of land value capture is for public good redistribution or cost recovery. Smolka asserted that the objective of land value capture is to improve the efficiency of land use management and to finance the provision of urban infrastructure and services via the land value increment captured by the local authority (Smolka, 2013). Fainstein (2012) argued that land value capture is for distributive purposes. Only by this way could the wealth created through public investments and administrative actions belong to all the citizens in a city.

2.4.2 Land leasing and land value capture

Land leasing

Private land freehold and public land leasehold are the two main land system in the world. Leasehold is widely used in countries like Netherland, Finland, Australia and China.

For most land leasehold countries, developers acquire land through public tender and public auction. Then the developers pay the leasing revenue via an up-front lump sum premium or a ground rent annually; they can even use a combination of those two kind of payment methods. These methods are later shared by the local and national governments (Hong, 2012). When residential housing developers finish construction, they will transfer their use right on a

parcel of land as commodity residential housing to the consumers. This use right on a parcel of land can also be transferred from one consumer to another consumer. Also, the obligation of land lease will also be transferred.

There is a lump sum leasing payment method in China. However, the premium at a time cannot present the whole future value that should be captured by the government. This is because the leasing period is relatively long; it is 40 years for industrial land, 50 years for commercial land, and 70 years for residential land.

Transfer payment of the real estate

When the residential housing owner transfers his or her house, he or she actually transfers both the building on the land and a parcel of land hidden behind the use right of the land. As a result, the seller should pay the capital gains tax at the same time that the buyers pay the transfer tax. The reason can be concluded from the hidden meanings of the tax base. The transfer tax is levied on the use right of this parcel of land; the capital gains tax is levied on the value increment of the housing, namely the value increment of the building and the land. Therefore, within the leasing system, these two taxes do not overlap even though they are both charged when housing ownership transfers.

2.4.3 Capital Gains Tax and land value capture

Capital gains tax is an instrument for land value capture (Walters, 2012). But some scholars assert that as a land value capture instrument, a capital gains tax is very uncertain for providing public infrastructure and services (Bahl and Wallace, 2008). Therefore, compared with other land value capture instruments, a capital gains tax is not so much about cost recovery. It is also about the revenue.

This is true because of two reasons. First, the trading volume of the secondary housing market is uncertain from year to year. Also, the value of capital assets is uncertain every year because the value is severely affected by economic contexts like inflation. Second, a capital gains tax is different from other taxes; the capital gains tax payment is collected and used for an uncertain purpose. This means that the revenue collected from the capital gains tax is not only used for public goods like public infrastructure and services.

In addition, the local governments usually capture land values via various land value capture instruments (Walters, 2012). Capital gains taxes are also collected by the local government.

2.5 Capital gains taxation policy and its outcomes in housing market

Capital gains tax effects

Since there are various types of taxes on housing, the following will review the academic discussion about the effect of capital gains taxes. Housing market demand, supply and housing prices are the main subjects involved in this research

Graham admits that a capital gains tax impacts the demand and supply of housing, but more evidence is needed to determine whether the capital gains tax affects the housing market positively or negatively, and to what extent (Graham, 2003).

There are different views about how capital gains tax affects the housing market demand and supply. Some scholars argue that a capital gains tax is negatively correlated with the housing market demand. Assuming that there is a stable supply of primary housing, a capital gains tax leads to the capitalization effect. The expected investment returns reduce. Then, the reduction of primary housing investment demand causes the reduction of newly-built housing prices. Because of the co-movement between primary and secondary housing prices, the prices of secondary housing decrease (Ayers, Lefanowicz, et al., 2007).

Similar to the capitalization effect, Chen states that a capital gains tax also brings the down payment effect, which also reduces the demand of housing market. The down payment effect is caused by sellers' increasing cash requirements. The expected down payment increases and prevents some potential second-hand housing consumers from accessing the second-hand housing market. Thus the demand for the secondary housing market reduces and the second-hand housing prices decrease at the same time (Calza, 2013).

All in all, the capitalization effect and the down payment effect are related to the housing demand and, because of them, the housing prices decrease.

However, other scholars claim that the lock-in effect caused by the capital gains tax will reduce the supply of the secondary housing market when the demand is stable (Ayers, et al., 2007). The reason is that when the investors sell their capital assets, they have to burden the related capital gains tax payment. This kind of tax burden increases the cost of investment and the expected investment returns; it actually reduces the benefit. Therefore, a number of investors are likely to give up the sales of their capital assets and possess them for a longer periods of time. This keeps these capital assets away from the secondary housing market. These capital assets, which cannot be traded in the secondary market because of the capital gains tax, are called locked capital assets. Then, since the supply decreased in the secondary housing market, the prices of second-hand houses increase. The increase of second-hand housing prices pushes a number of consumers into the primary housing market. Then the increase of primary housing market demand leads to the increase of primary housing market prices.

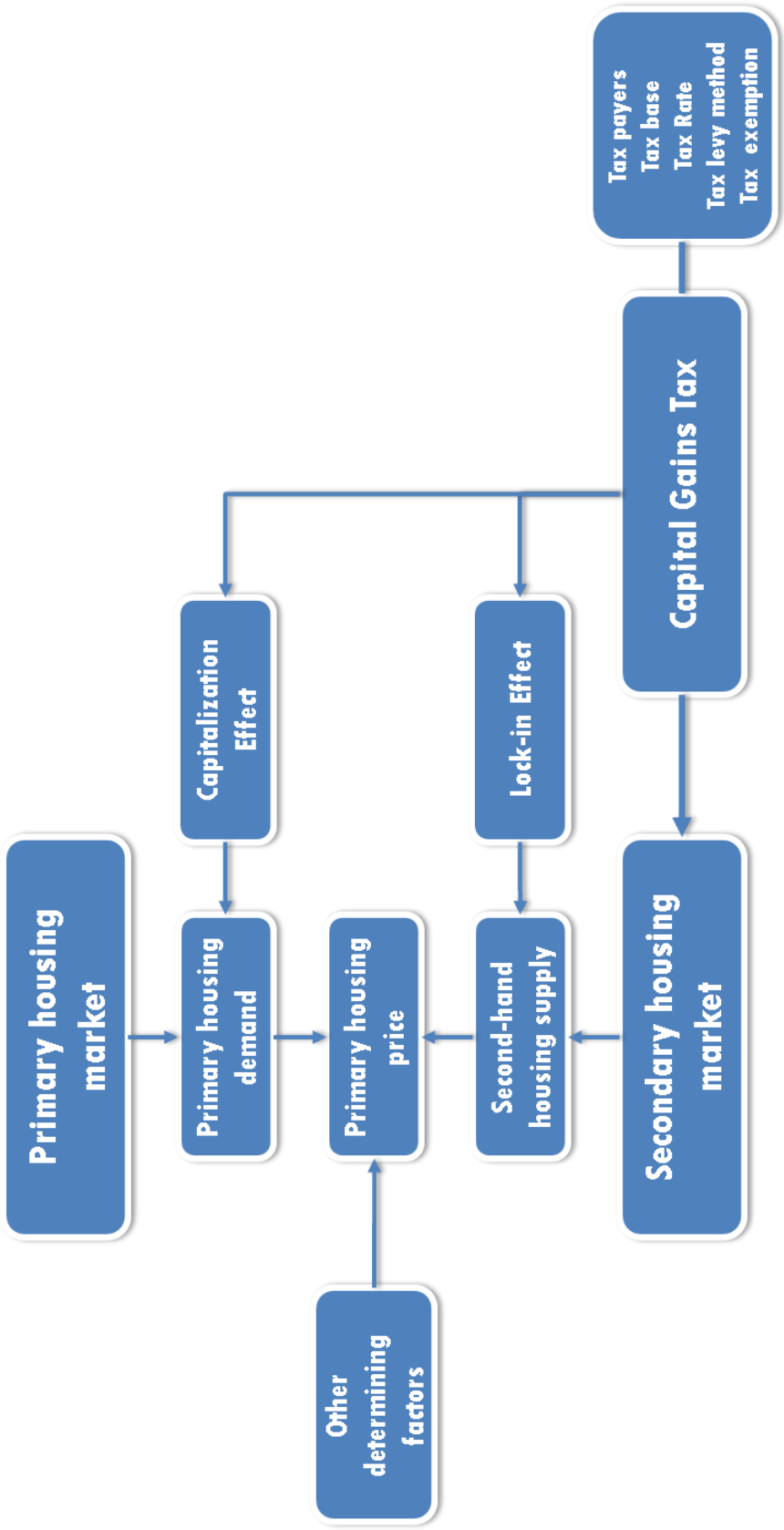
In addition, Dai and Maydew combined the capitalization effect and the lock-in effect for the same market to observe what would take place. An analysis showed that when the capitalization effect dominates the correlation between a capital gains tax and housing price is negative. When the lock-in effect plays a significant role, the correlation between a capital gains tax and housing price is positive and the housing market prices increase (Dai, et al., 2008).

In conclusion, a capital gains tax has impacts on investment strategies, and it determines the relationship between demand and supply. It plays an important role in determining the housing prices. How capital gains taxes affect the housing market supply and demand depends on the specific market context.

3. Conceptual framework

As a controlling policy, capital gains tax on the second-hand housing deals will affect the primary housing prices via the supply and demand. The effects of capital gains tax on housing market will cause capitalization effect or lock-in effect. But the housing price would also be affected by other factors.

Figure 2 The conceptual framework (Source: the author)



Chapter 3 Methodology

3.1 Revised Research Question(s)

The objective of this research is to explain the effectiveness of the second-hand housing capital gains tax as an instrument for the short-term and long-term stability of housing market. Thus, after reviewing relevant literatures and drawing conceptual framework, the research question can be revised as below:

How does the 20 percentage capital gains tax for second-hand housing transactions affect the primary housing prices in Wuhan from 2013?

To answer the main question, there are several sub-questions of this research:

1. What is the relationship between primary and secondary housing markets in Wuhan after the adjustment of the capital gains tax from March 2013 to June 2015?
2. To what degree did the capital gains tax affect the primary housing price in Wuhan from February 2013 to March 2015?
3. How does the capital gains tax operate in Wuhan?

3.2 Operationalization: Variables, Indicators

Based on the literature review in Chapter 2, there are three main concepts in my research: capital gains tax base, the primary housing market, and the secondary housing market. These three concepts are associated with the research objectives. The variables related to these three concepts can answer the sub-questions of this research.

3.2.1 Housing market relationship with the effect of capital gains tax

To analyse the inner relationship of the housing market, it is essential to analyse the primary and secondary housing market. Both primary and secondary housing markets have three components: the demand, supply and price. The variables should thus be based on the supple-demand and price aspects. Thus, the variables are shown in the table 7.

Table 7 Details of Variables about housing market performance (Source: the author)

sub-questions	Concepts	Variable	Indicator	Data Source
What is the relationship between primary and secondary housing market after the adjustment of capital gains tax from March 2013 to June 2015 in Wuhan?	Primary housing market	Newly-built commodity residential housing Transaction	housing prices of newly built houses	Secondary data from China Index Academy, Wuhan Housing Security and the Housing Authority
			Supply number of newly built houses	
			Demand number of newly built houses	
	Secondary housing market	Second-hand housing transaction	housing prices of second-hand housing	
			Supply number of second-hand housing	
			Demand number of second-hand housing	

3.2.2 To what degree, capital gains tax affect the primary housing prices

Since more than just the second-hand housing capital gains tax has an effect on the primary housing market, other determining factors should be considered as disturbance variables in this research. Thus, when analysing the degree of the effect of the capital gains tax on primary housing prices, the analysis result will be more reliable.

According to the literature, the disturbance variables and indicators of primary housing prices should include GDP, inflation, mortgage rate, bank interest rate, income, population, construction activities, second-hand housing prices, vacancy rate, land prices and other tax-related fees. However, taking into account the reality, feasibility and accessibly of relevant data collected, indicators such as vacancy rate, land prices and other tax-related fees will not be in this study. The reason for this is that in China the data about these three indicators are private, and are not publicly available. Also, the other tax-related fees are varied and this makes it difficult to distinguish the effect of each one.

Thus, the details of variables about other determining factors of primary housing prices are shown as table 8.

Table 8 Details of Variables about other determining factors of primary housing prices (Source: the author)

Sub-question	Concepts	Variable	Indicator	Data Source
To what degree, the capital gains tax affect the primary housing price from February 2013 to March2015 in Wuhan?	Primary housing market: Other determining factors of primary housing prices	GDP	GDP per capita	Secondary data from Wuhan Municipal Statistics Bureau
		Income per capita	average income per urban citizen	
		Population	Total urban residential population	
		Construction cost	average construction cost	
		Housing mortgage	mortgage rate	Secondary data from People's bank of China
		Bank interest	Interest rate	
		Inflation	Consumer price index	
		Housing market	Second-hand housing price	Secondary data from China Index Academy

3.2.3 Capital gains tax operation

According to the definition of capital gains tax, it has several components, but only the tax payer and tax amount is related to my research. Thus, the details of how tax payers will be applied in this research is shown in table 9.

Table 9 Details of Variables about capital gains tax (Source: the author)

Sub-question	Concepts	Variable	Indicator	Data Source
How does capital gains tax operate in China?	Capital Gains tax	tax payer's attitude	Whether the tax payers believe the effect of capital gains tax or not	Questionnaire survey with second-hand housing seller in Wuhan
		second-hand housing seller's motivation	Urging to need money	
			Improving life quality	
			Professional speculator	
			Normal Investor	
			Other	
		tax exemption	the only housing of the family, and other than 5 years	

3.3 Data Collection Methods

The data collection methods of this research mainly focus on quantitative data collection. The methods including obtaining relevant secondary data from the government and institutions and obtaining primary data from a telephone questionnaire.

First, obtaining relevant secondary data from existing databases is the main quantitative data collection method in this research. Not all of the macro- and micro-economic data about the housing market can be collected by an individual. The government and institutions such as the Wuhan Municipal Bureau of Local Taxation, the Wuhan Housing Security and Housing Authority, the Wuhan Municipal Statistics Bureau and the China Index Academy can provide reliable and sufficient statistical data and reports on their website for this study. Thus, there is no need for this study to collect primary data about the entire economic landscape or the primary and secondary housing markets. Therefore, in this research, all of the secondary data are from relevant government departments and institutes and were obtained by visiting their websites or offices.

Second, in order to obtain information about taxpayers and tax exemption, this study choose a telephone questionnaire method to collect the essential information about second-hand housing sellers. Compared with other types of questionnaire, a telephone questionnaire is more suitable in this study because this study does not need to gather very detailed information from the interviewees. Compared to the questionnaire, a structured interviewee

can judge whether or not an interviewee has knowledge about the content of the interview questions by observing the reaction of the questioners

The details about data Source and collection methods is shown in Table 10 below.

Table 10 Data collection methods (Source: the author)

Data Collection Methods	Data Source	Contents
Quantitative: Obtaining relevant data from existing data base	Wuhan Municipal Bureau of Local Taxation	Capital Gains Tax amount
	Wuhan Housing security and the Housing Authority	Primary housing demand amount, Second-hand housing demand amount, Primary housing supply amount, Second-hand housing supply amount
	China Index Academy	Primary housing trading prices, Secondary housing trading prices
	Wuhan Municipal Statistics Bureau	GDP Income Construction cost Population
	People's bank of China	Housing mortgage rates Bank interest rates Inflation
Quantitative: Structured interview	Second-hand housing sellers	Tax payers' attitude – believe or not Tax payers' motivation – five types Tax exemption

The data collection session was held during June and the beginning of July 2015 about three weeks. The specific arrangement of the time frame is shown in table 11 below. The budget about this research was adequate, mainly spending on the transport from Netherland to China.

Table 11 Time framework (Source: the author)

Week 1 06/15-06/19/2015	1. Contacting Wuhan Municipal Bureau of Local Taxation to obtain information about capital gains tax amount. 2. Visiting websites of Wuhan Municipal Statistics Bureau and People's Bank of China to obtain second-hand data about GDP, income, CPI, construction cost, bank interest rates, housing mortgage rates, and population.
Week 2 06/22-06/26/2015	1. Contacting Wuhan Housing security and the Housing Authority to get information about primary housing and secondary housing market in Wuhan. 2. Conducting interview with second-hand housing sellers to obtain information about the capital gains tax payers and tax exemption.
Week 3 06/29-07/03/2015	1. Visiting websites of China Index Academy to obtain the housing prices in Wuhan. 2. Sorting data.

3.4 Sample size and selection

1. for sub-question 1: What is the relationship between primary and secondary housing market after the adjustment of capital gains tax?

The variables which are involved for answering the first sub-question are the capital gains tax amount, primary housing demand, primary housing supply, primary housing price, second-hand housing demand, second-hand housing supply and second-hand housing price. The sample size for each data set is monthly data about the whole city. The research period of this study was from February 2013 to March 2015. After taking into account the availability of data access, every variable includes 26 monthly data.

All of the samples used to answer the first sub-question are based on the whole city. Additionally, to describe the housing supply, this study will use houses listed for sale as the housing supply data. To describe the housing demand, this study will use the trading volume as the housing demand data. Although the trading volume is not accurate enough to represent the real housing demand in both primary and secondary housing markets, there are no further accurate data available to represent the housing demand in the market than those about the trading volume. The primary and secondary housing price samples are the average trading prices for the whole city. The data about the amount of capital gains tax derive from data copied directly from the taxation department office.

2. for sub-question 2: To what degree, the capital gains tax affect the primary housing price?

To answer the second sub-question, the sample is selected based on panel data. The cross-section of individuals are the 8 central districts in Wuhan. The reason why these eight

districts were chosen is that they are the most centrally located districts. Economic activities are frequent and the housing market is relatively developed for each of the eight districts. Furthermore, the population of these eight districts account for nearly 61% of the total population (Wuhan Statistic Bureau, 2014). Finally, the land use changes in other districts are quite frequent because the other districts are still developing fast.

The cross-section variables of the panel data are the capital gains tax and the other determining factors of primary housing price. The panel data period is still from February 2013 to March 2015. There are a total of 26 monthly data for each cross-section variables and individuals.

3. for sub-question 3: How does capital gains tax operate in Wuhan?

In order to conduct a more complete survey of second-hand housing sellers in Wuhan, this study will still use the 8 central districts in Wuhan as the former part. According to the interview requirement, at least 30 samples are required for each district to ensure the validity of the research result. Because of the time limitation, 8 interviewees were selected for each district to increase the validity and reliability of the structured interviews. Hence, there were 64 telephone structured interviews in total.

The information on those interviewed was obtained via the second-hand housing transaction website. This ensured all the interviewees were active second-hand housing sellers in the market.

Then, after recording all the active second-hand housing sellers' information, this study distributed surveys to them randomly by selecting every eighth seller as the interviewee if he or she was not in the same neighbourhood as the previous selected interviewee. The reason for doing do so was to reduce the selection bias.

3.5 Validity and Reliability

3.5.1 Validity:

The variables and indicators are effective for analyzing the research questions because they are consistent with the literature and theories. They fulfill the requirement for content validity.

Besides, many other relevant research studies previously examined the variables and indicators working well. This fulfills the empirical validity.

3.5.2 Reliability:

The data were reliable because:

a) All of the data sources are official. They are from local authorities and statistical departments including the Wuhan Municipal Bureau of Local Taxation, the Wuhan Housing Security and Housing Authority, and the Wuhan Municipal Statistics Bureau and China Index Academy.

b) Double checking was conducted for data sources with different websites[6].

[6] For example, the data about primary and secondary housing market supply and demand were double checked in two different website, China Index Academy Website and E-housing Study institute Website.

3.6 Data Analysis Methods

To analyse the effect of a capital gains tax of second-hand housing deals on primary housing prices and to analyse how the capital gains tax of second-hand housing deals leads to the change of primary housing prices, this research adopted three methods.

Descriptive statistical analysis

The first data analysis method is simply a descriptive statistical analysis about the operation of the capital gains tax for second-hand housing transactions. Two components are analysed in this part.

The first component is the second-hand housing seller's motivation. To analyse it, the question of whether the target group of capital gains tax was as expected can be examined.

The second component is the taxpayer's attitude about the capital gains tax for second-hand housing transactions. To analyse it, this study looked at the result of the positive or negative attitude towards this tax on the second-hand housing transaction.

Stationarity Test and Co-integration Test

Before conducting the modelling analysis, all of the data should be put to a stationarity test to ensure that all of the data have time series properties. In this way, a spurious regression can be avoided. If all the original data are stationarity, the model could be conducted directly. If the original data are not stationarity, then the non-stationarity data should accept a differential operation. Then if the differential operated data are stationarity, then all of these first-order differential data should accept a co-integration test to make ensure the correct result of the regression.

Granger Causality Test

The second method is the Granger causality test to explain the relationship between capital gains tax, second-hand housing supply and primary housing prices. The general formulas of Granger Causality Test is:

Formula 1 The general formula of Granger Causality Test (Source: Gao, 2005)

$$Y_t = C_1 + \Sigma \alpha i X_{t-1} + \Sigma \beta_j Y_{t-1} + \mu_{1t}$$

$$X_t = C_1 + \Sigma \lambda i Y_{t-1} + \Sigma \partial_j X t\text{-}1 + \mu_{2t}$$

(C_1 is constant term, t-1 is lags, $\mu 1t$ and μ_{2t} is white noises)

The below table 12 is all be variables which will be used in the Granger Causality Test.

Table 12 Abbreviation and explanation of variables in Granger Causality Test (Source: the author)

Abb.	Name of variables	Explanation
CGT	Capital gains tax amount	The monthly financial revenue from capital gains tax on second hand housing transaction
SS	Secondary housing supply	The total supply amount of second-hand housing

SD	Secondary housing demand	The total demand amount of second-hand housing
SP	Secondary housing prices	The average prices of second-hand housing transaction
PS	Primary housing supply	The total supply amount of primary housing
PD	Primary housing demand	The total demand amount of primary housing
PP	Primary housing prices	The average prices of primary housing transaction

Panel Data Analysis

The second method is the panel data analysis. Through this analysis, the effect of the capital gains tax on the primary housing market will be examined. The panel data consisted of 8 different subjects, 26 time series variables and 8 determining primary housing price factors. The 8 different subjects are the different districts in Wuhan, including Jiangan, Jianghan, Qiaokou, Dongxihu, Wuchang, Qingshan, Hongshan, and Hanyang. The map of Wuhan and these eight districts is shown below in Figure 3.

Figure 3 The map of Wuhan (Source: the author based on Google map)

The model for panel data analysis of overall primary housing impact of Wuhan is:

Formula 2 The general formula of panel data regression (Source: Gao, 2005)

$$PHP_{i,t}=\alpha+\beta_1 X1_{i,t}+\beta_2 X2_{i,t}+\beta_3 X3_{i,t}+\beta_4 X4_{i,t}+\beta_5 X5_{i,t}+\beta_6 X6_{i,t}+\beta_7 X7_{i,t}+\beta_9 X8_{i,t}+\beta_6 X9_{i,t}+\varepsilon_t$$

(α is constant term, ε_t is interference factor, β is the coefficients)

And the 26 time series variables are the 26 months from February 2013 to March 2015. The 8 determining primary housing prices factors are shown in the table below.

Table 13 Abbreviation and explanation of determining primary housing prices factors (Source: the author)

Catalog	Abbreviation	Name of variables	Explanation
Dependent variable	PP	Primary housing prices	The monthly average trading prices of primary housing market
Independent variables	CGT	Capital gains tax amount	The total amount of capital gains tax on second-hand housing
	SP	Secondary housing prices	The monthly average trading prices of secondary housing market
	GDP	GDP per capita	The total amount of market value in a certain time period
	I	Income	The monthly personal disposable income
	CC	Construction cost	The cost on building construction materials
	MR	Housing mortgage rate	The Individual housing provident fund mortgage rate
	IR	Bank interest rate	The bank deposit interest rate
	CPI	Consumer price index	To reflect the inflation rate of macroeconomic
	POP	Population	The yearly permanent residential population

Chapter 4 Data analysis

In chapter 4, it makes an empirical analysis on the impact of capital gains tax on the primary housing market prices. It is consisted of three sections.

The first section is about the Granger Causality analysis of the primary housing market, secondary housing market and capital gains tax. How capital gains tax affect the primary housing market price can be known, whether it is a capitalization effect or a lock-in effect.

The second section is to what extend the capital gains tax affect the primary housing market in a more complicated environment. The analysis will be conducted throughout different districts in Wuhan. How the capital gains tax affects each districts differently will be revealed.

The third section is the explanation about the previous two section result.

4.1 The relationship between capital gains tax and primary and secondary housing market in Wuhan

4.1.1 Modelling introduction and data selection

In the first section, Granger Causality test will be used to analysis how the capital gains tax affect the operation of primary housing market and secondary housing market in Wuhan. In order to observe the effect of capital gains tax more obviously, there are short testing period and long testing period which are divided according to the previous analysis result of last section. Granger Causality Test will be conducted separately for each period separately to analyze the different lead-lag relationship between primary housing market and secondary housing market in different period.

Taking account of the availability, representative and usability of data, this section selects 26 monthly data from February 2013 to March 2015 to be applied for the granger causality test to get the empirical analysis of how capital gains tax affects primary housing prices. For each month, primary housing demand, supply, price, and secondary housing demand, supply price, and capital gains tax is the variables for the model, which will be marked as PD, PS, PP, SD, SS, SP, CGT respectively. And as all the variables in this section are economic variables, in order to eliminate the possibility of the existence of different variance, natural logarithm of the data is processed. After the natural logarithm of data, all the variables are marked as LPD, LPS, LPP, LSD, LSS, LSP, and LCGT respectively.

Moreover, the data of capital gains tax amount, primary housing price and secondary housing price have been discounted by the inflation, using the consumer price index of January 2013 as the baseline. After the discounted process, the real tax amount, primary housing price and secondary housing price can be obtained.

Besides, in order to find out the different relationship between primary and secondary housing price during different period, this research viewed the first 8 months as short period, the whole 26 months as long period in this granger causality test[7]. The short period is marked as 1, and the long period is marked as 2. For example, the capital gains tax variable in short period is marked as LCGT1, and in long period which is marked as LCGT2.

[7] The short and long period is divided according to the result of a series panel data regressions in Annex 2. In those panel data regressions, each regression model has one more month as the regression period than the later regression model. The breaking point of the short period and long period is the point which the probability value of capital gains tax in the regression result changes from insignificant to significant. According to the result, the short period should be 8 months. Besides, this breaking point is also applied to the panel data regression in Chapter 4.2.

Thus, the detailed variable list of Granger Causality Test is shown as below.

Table 14 the upgraded variable list of Granger Causality Test (Source: the author)

Name of variables	Variable abbreviation	Variable mark	Others
Capital gains tax amount	CGT	LCGT	Short period: LCGT1 Long period: LCGT2
Primary housing supply	PS	LPS	Short period: LPS1 Long period: LPS2
Primary housing demand	PD	LPD	Short period: LPD1 Long period: LPD2
Primary housing prices	PP	LPP	Short period: LPP1 Long period: LPP2
Secondary housing supply	SS	LSS	Short period: LSS1 Long period: LSS2
Secondary housing demand	SD	LSD	Short period: LSD1 Long period: LSD2
Secondary housing prices	SP	LSP	Short period: LSP1 Long period: LSP2

4.1.2 The Granger Causality Test for the short testing period

(1) Data Stationarity Test

The main purpose of establishing an econometric model is to predict the status and trend of related variables that may arise in the future (Wooldridge, 2012). Besides, the assumption of establishing an econometric model is usually that the historical and present status of time series variables is with representative or continuity, i.e. the basic characteristics of time series variables include that they can remain the same trend for a long period in the future and the time series can obey the probability distribution at any time point randomly. This is what so called the stationarity of time series variables.

Thus, conducting the data stationarity test is to ensure all the time series variables can be used to predict the future of those variables via the historical and present status of those variables (Kwiatkowski, et al, 1992). In other words, the basic idea of stationarity is that the probability laws that govern the behaviour of the process do not change over time.

Besides, if the essential characteristics of the sample time series variables only occurs in the current period. Those sample time series variables cannot continue into the future. That means that all the average value, variance and covariance of those time series variables is not a constant, which is meaningless for the econometric modelling, because those variables are only significant and meaningful for the specific period. In conclusion, if using the non-stationarity time series variables to conduct the econometric modelling, for example regression, it may result in spurious regression.

As all the variables in this model are time series variables, this study should also conduct the data stationarity test.

The common methods to test stationarity are graphic method and Augmented Dickey-fuller (ADF) unit root test (Mushtaq, 2011). Graphic method is quiet simple and clear, but it lacks of the statistic theoretical basis. So in this study, ADF unit root test method will be conducted among all the variables.

The null hypothesis of ADF test is that there is at least one unit root. If the ADF test statistic value is lower than the test critical value at 5% level, the null hypothesis will be rejected, which means that this time series is not stationarity because stationarity time series does not have any unit root. Therefore, non-stationarity time series can be transferred as stationarity time series by differential operation.

The results are in the table below.

Table 15 the result of AFD test for short testing period (Source: the author based on Eviews)

Variable	Type of model	Augmented Dickey-Fuller test statistic	Test critical values		Results
			5% level	10% level	
LCGT1	Constant, Linear Trend	-0.905798	-4.773195	-3.877714	Non-Stationarity
LPP1	Constant, Linear Trend	-12.43488	-4.773194	-3.877714	Stationarity
LPS1	Constant, Linear Trend	-46.71617	-4.450425	-3.701534	Stationarity
LPD1	Constant, Linear Trend	-14.98329	-4.450425	-3.701534	Stationarity
LSP1	Constant, Linear Trend	-3.681344	-4.450425	-3.701534	Non-Stationarity
LSS1	Constant, Linear Trend	-4.818218	-4.773194	-3.877714	Stationarity
LSD2	Constant, Linear Trend	-0.911258	-4.773194	-3.877714	Non-Stationarity
DLCGT1	Constant, Linear Trend	-7.364368	-4.773194	-3.877714	Stationarity
DLSP1	Constant, Linear Trend	-3.837999	-3.519595	-2.898418	Stationarity
DLSD1	Constant, Linear Trend	-7.469639	-4.773194	-3.877714	Stationarity

According to the result of the table, it is clear that the ADF test statistic value of primary housing price (LPP1), primary housing demand (LPD1), primary housing supply (LPS1), second-hand housing supply (LSS1) are all lower than the test critical values at 5% level, which means the null hypothesises are rejected by the ADF test and those variables do not have unit root, thus the data of primary housing price (LPP1), primary housing demand (LPD1), primary housing supply (LPS1), second-hand housing supply (LSS1) can be viewed

as time series variables of stationarity. However, the data of capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1) have an ADF test statistic value higher than the test critical value at 5%, which means that these three time series variable have at least one unit root, and they are not stationarity. Therefore, after the differential operation, the data of capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1) are ADF tested again. And the ADF test statistical values of those first-order difference series are lower than the test critical value at 5%, which proves that they are stationarity time series.

(2) Co-integration Test

Stationarity time series by the differential operation is integration series. Those integration series may have steady equilibrium relationship within the research period. As the data of capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1) are first order integration series, it is essential to conduct the co-integration test among them. This study for the short period modeling will use Engle-Granger co-integration test modeling because of the insufficient data of each variable (MacKinnon, 2010). In Engle-Granger co-integration test, whether the residual value series of the least square regression model among the data of capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1) are stationarity, is the criteria of whether there is a co-integration relationship among them. The result can be shown in the below table.

Table 16 the unit root test of the residual value series of the least square regression model among LCGT1, LSP1, and LSD1 (Source: the author based on Eviews)

Variable	Type of model	ADF Test Statistic	5% critical value	10% critical value
The residual value series	Constant, Linear Trend	-2.970128	-2.006292	-1.598068

According to the result, the ADF test statistic value is low than the 5% critical value, which means that the residual value series of the least square regression model among capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1) is stationarity. Therefore, there is co-integration relationship among capital gains tax amount (LCGT1), second-hand housing price (LSP1), second-hand housing demand (LSD1). They all have steady equilibrium relationship within the research period.

(3) Granger Causality Test for the short testing period

As shown in the previous stationarity test and co-integration test, variables have steady equilibrium relationship within a long period, which is the precondition of the Granger Causality Test (Granger, 1988).

Granger Causality Test is usually used for testing the whether there is a lead-lag relationship between variables.

Since this study is going to examine whether capital gains tax for second-hand housing deals cause capitalization effect or lock-in effect on primary and secondary housing market. The relationship between capital gains tax amount (LCGT1) and primary housing demand (LPD1), (LPD1) and primary housing price (LPP1), capital gains tax amount (LCGT1) and primary housing price (LPP1), capital gains tax amount (LCGT1) and second-hand housing supply (LSS1), second-hand housing supply (LSS1) and primary housing supply (LPS1), primary housing supply (LPS1) and primary housing price (LPP1) will be tested by Granger Causality Test.

For the equation group, the criteria of Granger Causality Test is:

a) If the null hypothesis is primary housing demand (LPD1) does not Granger Cause capital gains tax amount (LCGT1) and the probability value of the null hypothesis is higher than 10%[8], the null hypothesis can be accepted, which means that primary housing demand (LPD1) does not Granger Cause capital gains tax amount (LCGT1). Oppositely, if the probability value of the null hypothesis is lower than 10%, the null hypothesis should be rejected. Then, primary housing demand (LPD1) does Granger cause capital gains tax amount (LCGT1). The change of primary housing demand (LPD1) will result in the change of capital gains tax amount (LCGT1) later.
b) If the null hypothesis is capital gains tax amount (LCGT1) does not Granger cause primary housing demand (LPD1) and the probability value of the null hypothesis is higher than 10%, the null hypothesis can be accepted, which means that capital gains tax amount (LCGT1) does not Granger cause primary housing demand (LPD1). Oppositely, if the probability vale of the null hypotheses is lower than 10%, the null hypothesis should be rejected. Then, capital gains tax amount (LCGT1) does Granger cause primary housing demand (LPD1). The change of capital gains tax (LCGT1) will result in the change of primary housing demand (LPD1) later.
c) If the probability values of these two null hypothesis are both higher than 10%, there is no Granger Causality relationship between capital gains tax amount (LCGT1) and primary housing demand (LPD1). Oppositely, if the probability values of these two null hypothesis are both lower than 10%, primary housing demand (LPD1) and capital gains tax (LCGT1) are the Granger Causality of each other.

Meanwhile it is important to decide the best lag for Granger Causality Test, because of the insufficient data number of each variables and the short time period, the best lag in this short term Granger Causality Test is 1. This is a limitation of the short term model analysis.

Based on the criteria above, the result of Granger Causality Test for short period is shown in the table below.

Table 17 the result of Granger Causality Test for short period (Source: the author based on Eviews)

Null Hypothesis:	Lag	F-Statistic	Prob.
LCGT1 does not Granger Cause LPD1	1	11.1592	0.0288
LPD1 does not Granger Cause LCGT1	1	4.48674	0.1015
LPP1 does not Granger Cause LPD1	1	3.33567	0.1418
LPD1 does not Granger Cause LPP1	1	3.25022	0.1458
LCGT1 does not Granger Cause LPP1	1	7.63043	0.0507
LPP1 does not Granger Cause LCGT1	1	4.58243	0.0990

[8] The common probability value is 5%. Here, this study uses 10% as the probability value is because there is only one Granger Causality relationship is significant in both short and long period when the probability value is 5%. And when the probability value is 10%, there are more Granger Causality relationship in short period. However it will reduce the reliability of this study.

LSP1 does not Granger Cause LPP1 LPP1 does not Granger Cause LSP1	1 1	0.20657 4.25315	0.6730 0.1082
LSS1 does not Granger Cause LCGT1 LCGT1 does not Granger Cause LSS1	1 1	12.9329 0.18711	0.0228 0.6876
LSP1 does not Granger Cause LSS1 LSS1 does not Granger Cause LSP1	1 1	0.00543 1.62689	0.9448 0.2712
LPS1 does not Granger Cause LSP1 LSP1 does not Granger Cause LPS1	1 1	2.00914 73.2115	0.2293 0.0010
LPP1 does not Granger Cause LPS1 LPS1 does not Granger Cause LPP1	1 1	6.0585 4.13707	0.0696 0.1117

As shown in the table above, during the short testing period, except for five probability values lower than 10%, of which are the null hypothesis: capital gains tax amount (LCGT1) does not Granger Cause primary housing demand (LPD1), capital gains tax amount (LCGT1) does not Granger Cause primary housing price (LPP1), primary housing price (LPP1) does not Granger Cause capital gains tax amount (LCGT1), second-hand housing prices (LSP1) does not Granger Cause primary housing supply (LPS1), and primary housing prices (LPP1) does not Granger Cause primary housing supply (LPS1), the other null hypothesis are all accepted, which means there is no Granger causality between them. Among those five rejected null hypothesis, capital gains tax amount (LCGT1), second-hand prices (LSP1) and primary housing supply (LPS1) are the Granger causality of primary housing demand (LPD1), primary housing supply (LPS1) and primary housing supply (LPS1) respectively. Capital gains tax amount (LCGT1) and primary housing price (LPP1) are the Granger causality of each other, which means in the short period, there are very closely relationship between them. Besides, it is notable that although primary housing demand (LPD1) does not Granger Cause primary housing price (LPP1), the probability value of relatively low, only 14%, which means a relatively high probability that the change of primary housing demand (LPD1) can result in the change of primary housing price (LPP1).

4.1.3 The Granger Causality Test for the long testing period

(1) Data Stationarity Test

To examine the data stationarity, ADF unit root test modelling is conducted for all the time series variable. The result of the data stationarity test is in the table below.

Table 18 the result of AFD test for short testing period (Source: the author based on Eviews)

Variable	Type of model	Augmented Dickey-Fuller test statistic	Test critical values		Results
			5% level	10% level	
LCGT2	Constant, Linear Trend	-3.4710	-3.6032	-3.2381	Non-Stationarity
LPP2	Constant, Linear Trend	-4.0081	-3.6122	-3.2431	Stationarity
LPS2	Constant, Linear Trend	-4.522727	-3.603202	-3.238054	Stationarity
LPD2	Constant, Linear Trend	-3.5117	-3.6032	-3.2381	Non-Stationarity
LSP2	Constant, Linear Trend	-3.389036	-3.6032	-3.238054	Non-Stationarity
LSS2	Constant, Linear Trend	-3.1822	-3.6122	-3.2431	Non-Stationarity
LSD2	Constant, Linear Trend	-3.416357	-3.603202	-3.238054	Non-Stationarity
DLCGT2	Constant, Linear Trend	-7.6824	-2.9919	-2.6355	Stationarity
DLPD2	Constant, Linear Trend	-6.6010	-2.9919	-2.6355	Stationarity
DLSP2	Constant, Linear Trend	-4.241902	-3.644963	-3.261452	Stationarity
DLSS2	Constant, Linear Trend	-3.6353	-2.9981	-2.6388	Stationarity
DLSD2	Constant, Linear Trend	-7.469639	-4.773194	-3.877714	Stationarity

As shown in the table, except for that the ADF test statistic values of primary housing price (LPP2), second-hand housing price (LPS2) are lower than the test critical values at 5% level, the ADF test statistic value of the other variables are all higher than the test critical values at 5% level. Thus, capital gains tax amount (LCGT2), primary housing demand (LPD2), second-hand housing price (LSP2), second-hand housing supply (LSS2), second-hand housing demand (LSD2) should all be conducted differential operation. Then, after the differential operation, all the ADF test statistic value of the first-order difference series of capital gains tax amount (LCGT2), primary housing demand (LPD2), second-hand housing price (LSP2), second-hand housing supply (LSS2), second-hand housing demand (LSD2) are all lower than the test critical values at 5% level, which can reject the null hypothesis and prove these first-order difference series are stationarity.

(2) Co-integration Test

According to the result of data stationarity test, almost all the time series variables in long period are integration series. Therefore, there probably are steady equilibrium relationship

among these 7 variables during long period. Because the data number of variable in the long period are sufficient, the co-integration test will be examined by Johansen co-integration Test, of which the result is more accurate (MacKinnon, 2010).

The below table shows the result of the Johansen Co-integration Test among capital gains tax amount (LCGT2), second-hand housing price (LSP2), second-hand housing supply (LSS2), second-hand housing demand (LSD2), primary housing price (LPP2), primary housing demand (LPD2), and primary housing supply (LPS2).

Table 19 the result of the Johansen Co-integration Test among LCGT2, LSP2, LSS2, LSD2, LPP2, LPD2, and LPS2 (Source: the author based on Eviews)

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.987297	269.2455	125.6154	0
At most 1 *	0.907115	164.4638	95.75366	0
At most 2 *	0.833109	107.4304	69.81889	0
At most 3 *	0.76919	64.46048	47.85613	0.0007
At most 4	0.526403	29.27266	29.79707	0.0574
At most 5	0.350186	11.33508	15.49471	0.1917
At most 6	0.040387	0.989408	3.841466	0.3199
Trace test indicates 4 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.987297	104.7817	46.23142	0
At most 1 *	0.907115	57.0334	40.07757	0.0003
At most 2 *	0.833109	42.96989	33.87687	0.0032
At most 3 *	0.76919	35.18782	27.58434	0.0044
At most 4	0.526403	17.93758	21.13162	0.1322
At most 5	0.350186	10.34567	14.2646	0.1902
At most 6	0.040387	0.989408	3.841466	0.3199
Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

As shown in the table, the null hypothesis (no co-integration equation, at most 1 co-integration equation, at most 2 co-integration equation, and at most 3 co-integration equation) are rejected, because the probability value of these four null hypothesis are lower than 5%, no matter in the Trace model or in the Max-Eigen Statistic model. As a result, there are at least 4 co-integration between the capital gains tax amount (LCGT2), second-hand housing price (LSP2), second-hand housing supply (LSS2), second-hand housing demand (LSD2), primary housing price (LPP2), primary housing demand (LPD2), and primary housing supply (LPS2). Consequently, all the variables are stationarity, which is the precondition for the Granger Causality Test.

(3) Granger Causality Test for the long testing period

Before conducting Granger Causality Test for the long testing period, it is essential to decide the best lag. In this study, majority rule is adopted. The result of the majority rule is as below.

Table 20 The best lag selection by the different criterion (Source: the author based on Eviews)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	189.0258	NA	6.10E-16	-15.1688	-14.8252	-15.0777
1	300.6259	148.8	3.98E-18	-20.3855	-17.6367	-19.6562
2	401.0078	75.28648*	2.08e-19*	-24.66732*	-19.51333*	-23.29997*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

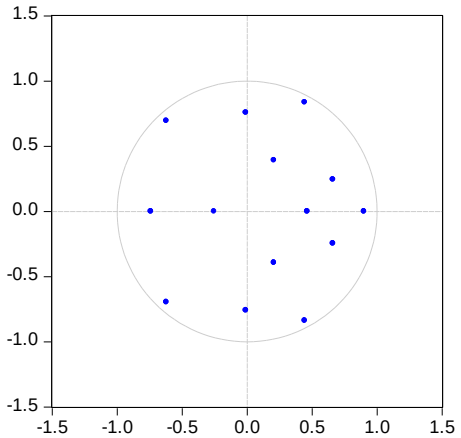
AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

As shown in the table above, according to the criteria of which lag the AIC and SC value is both lowest, lag 2 should be the best lag for the coming Granger Causality Test. Besides, to ensure the best lag is lag 2, inverse roots of AR characteristic Polynomial figure can examine the stability of the Granger Causality Test model. If all the point are inside the circle, it refers to that the best lag can make the model stable.

Figure 4 inverse roots of AR characteristic Polynomial



Because as shown in the figure, all the point are inside the circle, so that the model should be stable, the another precondition of Granger Causality Test for long testing period is existing.

The same as the previous test for short testing period, the Granger Causality Test for long testing period still analysis the relationship between capital gains tax amount (LCGT2) and primary housing demand (LPD2), primary housing demand (LPD2) and primary housing price (LPP2), capital gains tax (LCGT2) and primary housing price (LPP2), capital gains tax amount (LCGT2) and second-hand housing supply (LSS2), second-hand housing supply (LSS2) and primary housing supply (LPS2), primary housing supply (LPS2) and primary housing price (LPP2). The test result is in the table below.

Table 21 the result of Granger Causality Test for long period (Source: the author based on Eviews)

Null Hypothesis:	Lag	F-Statistic	Prob.
LCGT2 does not Granger Cause LPD2	2	0.38754	0.684
LPD2 does not Granger Cause LCGT2	2	0.45088	0.6437
LPP2 does not Granger Cause LPD2	2	0.1554	0.8572
LPD2 does not Granger Cause LPP2	2	1.3178	0.2911
LCGT2 does not Granger Cause LPP2	2	0.36678	0.6978
LPP2 does not Granger Cause LCGT2	2	0.25675	0.7762
LSP2 does not Granger Cause LPP2	2	8.4845	0.0023
LPP2 does not Granger Cause LSP2	2	0.27165	0.765
LSS2 does not Granger Cause LCGT2	2	1.11853	0.3473
LCGT2 does not Granger Cause LSS2	2	2.56608	0.1032
LSP2 does not Granger Cause LSS2	2	1.81265	0.1903
LSS2 does not Granger Cause LSP2	2	2.37786	0.1198
LPS2 does not Granger Cause LSP2	2	2.46585	0.1117
LSP2 does not Granger Cause LPS2	2	0.42387	0.6606
LPP2 does not Granger Cause LPS2	2	0.04189	0.9591
LPS2 does not Granger Cause LPP2	2	1.24419	0.3106

According to the result of Granger Causality Test for the long period testing, only one null hypothesis is rejected: second-hand housing price (LSP2) does not Granger Cause primary housing price (LPP2). Thus, during the long period, only second-hand housing price (LSP2) can Granger cause primary housing price (LPP2), and second-hand housing price (LSP2) has

the lead-lag relationship with primary housing price (LPP2). All the other null hypothesis are accepted. Hence, there is no lead-lag relationship among those variables.

In conclusion, during the long period, the capital gains tax has no effect on both primary and secondary housing market. Only second-hand housing price can affect the primary housing price, which is the only bound between primary housing market and secondary housing market.

4.2 The analysis of primary housing market price determining factors

In order to analyze the effect of capital gains tax on primary housing market price, the data analysis and empirical panel data regression study select 8 central districts in Wuhan where the trading activities are frequent and active in both primary housing market and secondary housing market.

Based on the theoretical literature review in previous chapter 2, several other determining factors on primary housing prices are selected with the capital gains tax amount as the independent variables in this panel data regression model to analyze the effect of each one on primary housing market prices. Hence, the panel data regression model is as below:

Formula 3 The specific formula of panel data regression (Source: the author based on Gao, 2009)

$$PHP_{i,t}=\alpha+\beta_1 SP_{i,t}+\beta_2 GDP_{i,t}+\beta_3 CGT_t+\beta_4 POP_{i,t}$$
$$+\beta_5 IR_{i,t}+\beta_6 I_{i,t}+\beta_7 CC_{i,t}+\beta_9 MR_{i,t}+\beta_6 CPI_{i,t}+\varepsilon_t$$

(α is constant term, ε_t is interference factor, β is the coefficients)

And,

Table 22 the list of dependent and independent variables of panel data regression (Source: the author)

	Abbreviation	Name of variables	Others
Dependent variable	PP	Primary housing prices	Short period: PHP1 Long period: PHP2
Independent variables	CGT	Capital gains tax amount	Short period: CGT1 Long period: CGT2
	SP	Secondary housing prices	Short period: SHP1 Long period: SHP2
	GDP	GDP per capita	Short period: GDP1 Long period: GDP2
	I	Income per capita	Short period: I1 Long period: I2
	CC	Construction cost	Short period: CC1 Long period: CC2

	IR	Bank interest rate	Short period: IR1 Long period: IR2
	MR	Housing mortgage rate	Short period: MR1 Long period: MR2
	CPI	Consumer price index	Short period: CPI1 Long period: CPI2
	POP	Population	Short period: POP1 Long period: POP2

The panel cross-section individuals are the 8 central districts of Wuhan, Jiangan, Jinaghan, Qiaokou, Dongxihu, Wuchang, Qingshan, Hongshan and Hanyang.

All the data about primary housing market and secondary housing market for each district are obtained from the real estate study institute.

The capital gains tax amount data of each district are from Wuhan Municipal Bureau of Local Taxation.

The bank interest rate and housing mortgage rate are from the official website of People's Bank of China.

The CPI, construction cost, income, GDP and population data is from the Wuhan Statistic Bureau year book.

Beside, in this section, the panel data regression analysis will also be shown in short period and long period. Same as the Granger Causality Test, the different period is divided according to the probability value change of the capital gains tax in a series regression model. In other word, the short period is still 8 months and the long period is still 26 months.

4.2.1 The empirical panel data regression analysis for short period

(1) Data stationarity test

Similar to the Granger Causality Test in the former section, data stationarity test is also the precondition of the panel data regression analysis. Thus, unit root test is conducted for the data stationarity test[9].

Except for variable population (POP1), bank interest rate (IR1), and mortgage rate (MR1), all the other variables are lower than 0.01 probability value. Thus, variables construction cost (CC1), capital gains tax amount (CGT1), CPI1, GDP1, primary housing price (PP1), second-hand housing price (SP1), and income (I1) can reject the null hypothesis of existing unit root process. These 7 variables are stationarity. Besides, because variable interest rate (IR1) and mortgage rate (MR1) are decided by the People's Bank of China and variable Population are stable in the short period, these three variables remain the same data in the short period. They are abnormal data, and they should be omitted from the panel data regression model.

[9] The result of stationarity test in is in Annex 2.

(2) Multi-collinearity Test

No multi-collinearity is another precondition of this panel data regression model. In order to examine whether there is multi-collinearity existing, this study adopts variance inflation factor (VIF) method to find out multi-collinearity.

According to the result of VIF test[10], there is no multi-collinearity among all the variables. Although the VIF value of GDP1 is relatively high, which is 7.70, it is still lower than the criteria value of 10. As a result, all the variable can meet the precondition of no multi-collinearity.

(3) The result of panel data regression model

Generally speaking, there are three types of panel data regression model which may have totally different result. These three types of panel data regression model are Pooled Regression Model, Fixed Effects Regression Model, and Random Effects Regression model.

To choose the most suitable model, the first step is using homogeneity of variance test to choose it is a pooled regression model or a fixed/random effect regression model. If calculated F statistic value of sample is higher than the standard Fα (T-1, N-T-k) statistic value at the 1%, 5% and 10% level, fixed effect regression model should be adopted[11] (Gao, 2005).

According to the result of this test, the panel regression model for the short term testing period should be the fixed effect regression model rather than a pooled regression model. The result is in the table below.

Table 23 the result of F statistic value test (Source: the author based on Eviews)

Sum Squared residual	Pooled	1769592
	Fixed	207869.6
F statistic value of sample		31.30413
Fα(7, 50)	α=0.1	2.53
	α=0.05	3.37
	α=0.01	5.80

The second step is to choose it is a fixed effect regression model or a random effect regression model. Usually, Hausman test is used to decide whether the panel data is suitable for a fixed effect model or a random effect model. If the probability value of Hausman test is lower than 0.05, fixed effect model is compulsory; if the probability value of Hausman test is higher than 0.05, then both fixed effect model or random effect model can be chosen (Zhang, 2007).

[10] The result of VIF test is in Annex 3.

[11] N is the number of cross-section individuals, T is the number of total observation months, k is the number of independent variables. The calculation equation is :

$$F = \frac{[(SSEp - SSEf)/(T + k - 2)}{[SSEf/(NT - T - k)]}$$

After conducting the Hausman test, the probability value is 0.9861. Since the probability value is higher than 0.05, random effect model should be chosen, but taking in account that the fixed effect model can estimate the internal error of the individual heterogeneity and temporal heterogeneity in the disturbance terms to improve the accuracy and consistency of the results (Gao, 2005). Hence this panel data analysis for the short period choose the more commonly used fixed effect regression model, the result of panel data regression is in the table.

Table 24 the result of fixed effect regression model for short period (Source: the author based on Eviews)

Variable	Coefficient
CGT1	-7.30806*
	(3.05595)
SP1	0.79600***
	(0.05755)
CC1	0.58211**
	(0.24789)
CPI1	-59.26433***
	(16.76457)
I1	1.14600**
	(0.39924)
GDP1	-1.68618
	(5.96536)
Constant	5334.340**
	(1685.404)
R-squared	0.983095
F-statistic	223.6630
Prob(F-statistic)	0.000000
* p<0.05	
** p<0.01	
*** P<0.001	

In the short period, except for GDP, all the other variables affect the primary housing prices to different degrees in Wuhan.

SHP is the most significant variables to determine primary housing prices, but the effect is relatively slight. According to the result of panel data regression model, second hand housing prices increase 1 dollar can lead to 0.79 dollars increasing in primary housing prices.

CPI is another most significant variables to affect the primary housing prices, and the effect of consumer price index is the most obvious. 1 index increases in consumer price index can cause 59.2 dollar decreasing for primary housing prices.

Although the probability value of capital gains tax (CGT) is 0.0206 which means the capital gains tax in short period is not a very significant independent variable to primary housing prices, but the coefficient of capital gains tax is relatively high compared with other variables. Every 1 million dollar capital gains tax amount increase can result in 6.9 dollars decreasing in primary housing prices. From this, it is clear that capital gains tax has a certain effect on controlling the primary housing prices increasing.

Construction cost (CC) and income (I) also significant independent variables to primary housing prices. For construction cost, every 1 dollar construction cost increasing can cause 0.58 dollars primary housing prices going up. And every 1 dollar average income per urban citizen increasing can cause nearly 1 dollar increasing primary housing prices.

And since the R-squared is 0.98, it means that this fixed effect regression model has very high explanatory level for the primary housing market prices.

4.2.2 The empirical panel data regression analysis for short period

(1) The result of panel data regression model

After testing data stationarity through Levin, Lin & Chu test, the probability value of each variable are lower than 0.05, which means that all the variable can meet the precondition of stationarity[12].

And still using VIF method to test multi-collinearity, all the VIF value is lower than 10. Thus, there is no multi-collinearity among the variables. No multi-collinearity precondition can also be fulfilled[13].

Then using the same method, i.e. F statistic test and Hausman test, to choose which type of panel data regression model should be used for the long period regression, the result of the Hausman test is that the probability value is 0.99. Fixed effect regression model is still the most suitable model in this study.

The result of the fixed effect regression model is in the table below:

[12] The result of stationarity test is in Annex 3.

[13] The result of VIF test is in Annex 4.

Table 25 the result of fixed effect regression model for long period (Source: the author based on Eviews)

Variable	Coefficient (Std. Error)
CGT2	-2.7408 (2.7006)
SP2	0.7054*** (0.1673)
CC2	3.134912* (1.420505)
CPI2	-17.9654 (10.68583)
I2	0.628258* (0.308094)
GDP2	7.0951 (4.3713)
IR2	19.3803 (25.30828)
MR2	-0.80732 (70.3907)
POP2	0.001688 (0.001206)
C	7.095094* (3.304339)
R-squared	0.922985
F-statistic	143.0643
Prob(F-statistic)	0.000000
* p<0.05 ** p<0.01 *** P<0.001	

Through the fixed effect regression model for long period, it is easy to find that only second-hand housing price (SP2), construction cost (CC2), and income (I2) have a significant effect on primary housing market price. The research topic of this study, capital gains tax (CGT2) has a probability higher than 0.05, which means in the long period, it cannot affect the primary housing market price greatly.

Second-hand housing prices is still the most significant affecting factors to the primary housing prices. There would be a 0.7 dollars increasing with every 1 dollar increasing of second-hand housing prices. This result is similar to the characteristic of how second-hand housing prices affect the primary housing prices in short period.

Besides, construction cost and per capita disposable income of urban residents are also significant independent variables to affect the primary housing prices. Construction cost increase 1 dollar will lead to 3.1 dollar increasing in primary housing price. And, every 1 dollar increasing average disposable income of urban residents will result in 0.6 dollars primary housing price increasing.

Meanwhile, compared with the result of the short period panel data regression, capital gains tax and consumer price index are no longer significant determining independent variables for primary housing price, because the probability value of these two variables are higher than 0.05.

As for new variables for the long period, i.e. bank interest rate, mortgage rate and population also cannot affect the primary housing prices in Wuhan greatly.

Overall, the result of the panel data regression for the long period is similar to the short period result. Second-hand housing price is the most significant determining variable to the primary housing market. The most important difference is capital gains tax is no longer an essential factor to determine the primary housing market price.

4.3 Conclusion and explanation

According to the empirical analyses of the relationship between primary and secondary housing markets and to what degree a capital gains tax can affect the primary housing price, it is obvious that primary housing prices can be affected over a short period. However, for a longer period, the capital gains tax for second-hand housing deals does not have a significant effect on primary housing prices. In this section, the reason why there is such a difference between short and long period will be revealed.

4.3.1 Explanation about why capital gains tax can affect primary housing market in short period

As shown in the result of the Granger Causality Test and fixed effect regression model for the panel data, the capital gains tax has a significant effect on primary housing prices.

Lower primary housing demands leads to lower primary housing price

According to the result of the Granger Causality Test, for a short testing period, the adjustment of the capital gains tax is the leading cause of the change of the primary housing market demand. Although the primary housing market demand does not have a significant leading effect on the primary housing price, the capital gains tax has a significantly direct effect on the primary housing market. Therefore, the adjustment of the capital gains tax affects the primary housing market price for short period of time.

Combined with the result of panel data regression, the effect of the capital gains tax on the primary housing prices is negative. Thus, it is obvious that the controlling policy of the capital gains tax regarding second-hand housing deals has a certain negative effect on primary housing market prices. In short, it can make the primary housing prices decrease.

In the first 8 months following the adjustment of the capital gains tax, the average amount of primary housing market demand was 10% lower than for the long period. According to the

result of the Granger Causality Test for the short testing period, it is lead-lag caused by the adjustment of the capital gains tax. Although the primary housing price went up after the adjustment of the capital gains tax, compared with the longer period between 2014 and 2015, it is clear that the increasing rate of primary housing price in the short period is lower than that for the long period. The average primary housing price had an increasing rate in the short period; it was a 104.61% increase over the previous year, 2013. However the average primary housing price rate of increase in long period is up to 116.52%. As a result, the capital gains tax has had a significant effect on short period primary housing prices.

Moreover, the performance of the capital gains tax on the secondary housing market is not so significant. This means that in short period, the capital gains tax had a more significant effect on the primary housing market than on the secondary housing market. Though the secondary housing demand and supply increased greatly compared with the previous month for the second month after the adjustment of the capital gains tax, it was not lead-lag caused by the capital gains tax according to the result of Granger Causality Test for the short period.

In conclusion, for short period, the adjustment of the capital gains tax could negatively affect primary housing prices.

To what degree, capital gains tax affect the primary housing market

According to the result of panel data regression model for the short period, this negative effect of the capital gains tax on primary housing price is as follows: with every 1 million dollar increase of the capital gains tax amount, there will be a 7.3 dollar decrease in the primary housing price. It is not a very significant effect, but compared with other determining variables the capital gains tax can affect the primary housing price greatly.

However, as mentioned above, the primary housing price did not drop in Wuhan from February 2013 to August 2013. One possible reason might be the decrease of the capital gains tax amount as well. The average month to month growth rate is -6% for the short period. Because the rate of decrease is just -6%, the primary housing price went up very slowly.

Last, the decreasing capital gains tax amount can also signal that the capital gains tax had significant effect on the primary housing price for the long period.

Overall, for a short period, the capital gains tax can negatively affect the primary housing price greatly. However, since the tax amount is decreasing, the adjustment can only control the primary housing price increase slightly and steadily.

Other conclusions for the short period

Another reason for the result of the slightly increasing primary housing price in short period is the market environment.

As it is known, the capital gains tax amount is not the only significant variable which affects the primary housing prices. Income per person, construction cost, consumer price index and second-hand housing prices can also affect the primary housing prices for a short period and they are even more significantly related to the primary housing prices. As a trading and investment good, primary housing is a part of the market environment and, as such, it is greatly affected by the developed or developing financial market environments and market mechanisms. Especially for the second-hand housing prices, this is the most significant determining factor for the primary housing market in the short period Wuhan housing market. This also meets the housing market theory discussed in the literature review.

Therefore, for the short period, the capital gains tax for second-hand housing deals is not the only way to control primary housing prices. Developing market mechanisms for the financial and housing markets is also essential for stabilizing primary housing prices.

4.3.2 Explanation about why capital gains tax cannot affect primary housing market in long period

According to the empirical analysis in the previous two sections, the capital gains tax has no controlling effect on the primary housing market price no matter if it is in the primary and secondary housing market itself or in the greater macro- and micro-economic environment. The reasons are discussed below.

Although for the short term it is undeniable that the capital gains tax has a significant effect on primary housing prices, this kind of significant effect is a failure for long term periods. This is the main reason why the capital gains tax cannot control, stabilize or even lower the primary housing market price. Specifically, the reason for this failure can be seen in every aspect of the capital gains tax itself. According to the literature review in Chapter 2, it is clear that the concept of a capital gains tax includes taxpayers, a tax base, a tax rate, tax levy methods, tax exemption, and a tax amount. Thus, the analysis of the reason for this failure should be found using these aspects.

a) ***Tax amount.*** As analyzed for the short term effect of capital gains tax on primary housing prices, the decreasing capital gains amount is the reason why the primary housing price is under-controlling but still increasing. For the long term, the capital gains tax amount suffers the same problem. The decreasing rate is even higher than that of the short period. This might be the reason for the failure of the capital gains tax. The average capital gains tax amount per month for the first eight months of the short period is 20% higher than the average capital gains tax amount for the whole February 2013-August 2013 period. For each district, the capital gains tax amounts are all decreasing.

   However, the reason why the capital gains tax amount decreases is none of the business of the secondary housing market. First, the capital gains tax for the second-hand housing deals is 20% of the total second-hand housing trading price, which should be closely related to the second-hand housing market prices. Second, as part of the government's financial revenue, the total capital gains tax amount should be closely related to the secondary housing market's trading volume.

   In reality, the secondary housing market prices in each central district of Wuhan have steadily increased after the policy a strictly implemented 20% capital gains tax on second-hand housing deals. The secondary housing trading volumes in each district of Wuhan also have a periodical characteristic. Because of the Spring Festival, economic activities decrease for the whole country every January and February. This also results in the lowest second-hand housing trading volumes occurring during these months every year. The housing trading volume will go up with the arrival of a new year. As a result, the secondary housing market in Wuhan from February 2013 did not have an obvious phenomenon.

Figure 5 the average capital gains tax amount of second-hand housing deals in every district of Wuhan in short period and long period comparison (Source: Municipal Bureau of Local Taxation, 2015)

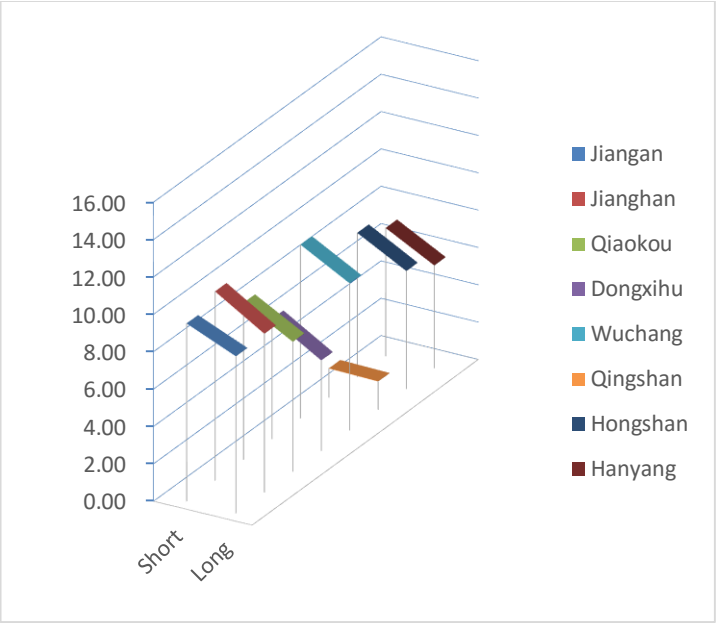


Figure 6 the secondary housing prices in every district of Wuhan from February 2013 (Source: secondary data from China Index Academy)

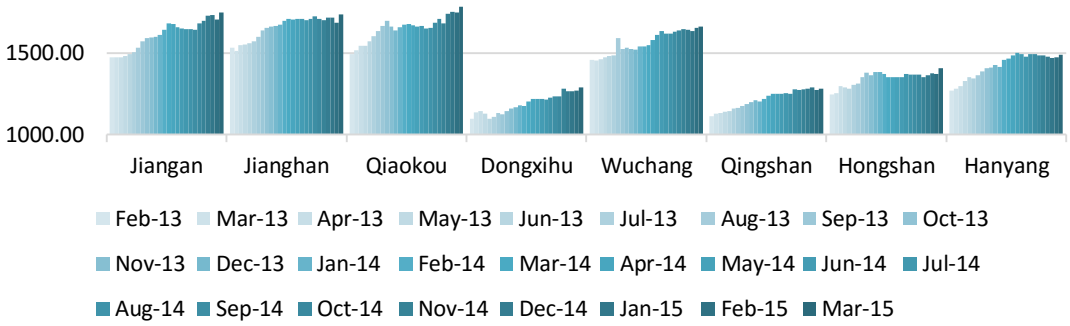
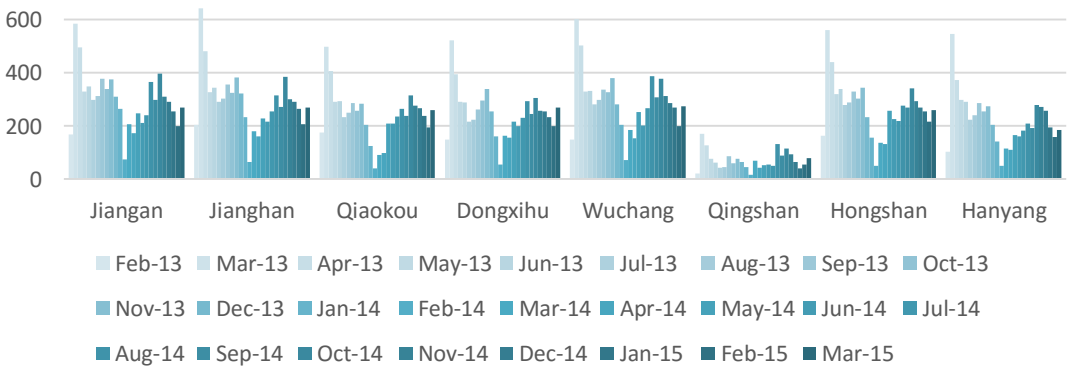


Figure 7 the secondary housing demand in every district of Wuhan from February 2013 (Source: secondary data from China Index Academy)



b) ***Tax rate and tax base.*** It is undeniable that regulation about the tax rate and the tax base was not changed by the government within these two years. The tax base is still composed of all the finalized second-hand housing deals. The tax rate remains 20% of the total second-hand housing selling prices. Thus, the tax rate and the tax base are not the reasons why the capital gains tax for second-hand housing deals failed for the long period.

c) ***Tax levy method and process.*** First, the capital gains tax for second-hand housing deals is a one payment tax. This did not changed within the two years. Thus, the tax levy method is not the reason for the capital gains tax failure. Second, the process of how the taxation departments charge it and how the taxpayers pay it is open and transparent in Wuhan now, according the new governmental regulations. As a result, corruption and fake taxation records will not occur. Thus, the tax charging and paying process will not result in the failure of the capital gains tax effects.

d) ***Tax exemption policy.*** According to the tax exemption regulation, the taxpayer will be free from the tax only when two conditions are met at the same time: when the second-hand housing is the only real estate possession and when the second-hand housing is older than five years.

   According to the structured interviews conducted by the author among Wuhan's second-hand housing sellers, nearly 20% of second-hand housing sellers meet the two conditions at the same time. The result of this survey shows that in the long period，most second-hand housing sellers will not undertake the holding cost of capital due to fact that they meet the tax exemption policy. However, this survey is just focused on the second-hand housing sellers' current situation. Their situation is unknown for the beginning of the period of capital gains tax adjustment. Therefore, it is possible that most of second-hand housing sellers have more knowledge about how the capital gains tax operated and how they could meet the tax exemption policy after two years.

   In conclusion, the tax exemption might be a reason explaining the failure of the capital gains tax effect.

e) ***Tax payer***. There is no denying that the capital gains tax taxpayers are all of the second-hand housing sellers. The regulation regarding who should be the tax payer did not change within the two years. However, this unchanged fact does not mean that the taxpayer's decision-making psychology nor their attitude towards the capital gains tax has not changed.

   First, according to the Wuhan second-hand housing turnover amount figure (Figure 05), Wuhan's second-hand housing turnover reached the highest point in the two year period and the turnover was two times the average turnover amount of the two year period. This is due to the sudden promulgation of the capital gains tax policy on second-hand housing, which caused a certain degree of panic amongst second-hand housing holders and consumers. Second-hand housing owners fear that the capital gains tax will increase their capital holding cost. Second-hand housing consumers are worried that with the growth of the total price of secondary housing prices, the purchasing price of their new possessions will increase because the sellers are likely to pass the capital gains tax onto them. Thus, secondary housing turnover grew sharply. However, as time passed, this kind of panic gradually disappeared. As a result, a change in the taxpayer's psychological decision-making behavior can eventually influence the effect of the capital gains tax.

Second, according to the author's structured interviews of Wuhan's second-hand sellers, nearly 50% of the second-hand housing sellers do not believe that the capital gains tax had an effect on controlling primary housing prices. This means that the capital gains tax was not as successful as expected at becoming a considering factor for second-hand housing sellers' decision-making. This is also one reason why the capital gains tax failed for the long period.

All above, the tax amount, tax exemption and taxpayers are the reasons why the capital gains tax failed for the long period.

Chapter 5 Conclusion and recommendation

This chapter first reviews the background and the problem statement of this research. Then, all the research questions are answered. In the last part, recommendations about relevant policies and further studies are provided.

5.1 Retrospect

Since the housing system reform in 1983, China's housing system has been transformed to the market-oriented supply system. This housing system reform has greatly improved the average living conditions and average living area, but also has brought some inevitable market problems such as unaffordable housing prices. In this research, the research subject, the city of Wuhan, suffered this problem. The housing price income ratio is 8. This is higher than both the average housing price income ratio of 7.4 in China and the international standard of 7.

In order to solve the unaffordable housing price in the market, the Chinese government has taken a series of measures to curb the growth of house prices. The capital gains tax on second-hand housing deals is one of those measures.

Since the establishment of Individual Income Tax Law in 1994, the capital gains tax on individual property transactions is also regulated. According to the regulation of Individual Income Tax Law, 20% of the profit earned from individual transactions of capital assets have to be paid as the capital gains tax. However, taking into account the loss of the original purchase invoices and other real factors, the capital gains tax was revised to be 1% to 3% of the total house selling price. Given the high housing prices in China, 1% to 3% of the total housing selling price is much lower than the 20% of the profit from housing sales. Therefore, this greatly reduced the investors' holding cost of houses in the primary housing market. This means that one of the reason why the housing price is unaffordable is the low holding cost of houses as investments. As a result, the majority of the low-middle income people who have rigid housing demands is hindered by the unaffordable housing prices.

To solve this abnormal fact in primary housing market, in the beginning of 2013, the national government promulgated a national announcement about five relegations. It re-adjusted the rules for implementing the capital gains tax for second-hand housing deals. In the new adjustment, the tax rate is 20% and the tax base must be the profit of housing sale. If the original housing purchase invoice is really lost, the profit must be calculated using the market price at the purchase year.

This research focused on the effect of the capital gains tax on the second-hand housing deals on primary housing prices. To analyze this topic, this research selects February 2013 to March 2015 as the observation period and uses the econometric model as its data analysis method. The relationship between primary and secondary housing markets after the adjustment of capital gains tax, to what degree the capital gains tax affects the primary housing price, and how the capital gains tax operated are the three areas that constitute this research analysis.

5.2 Conclusions

5.2.1 The short and long period different effect of capital gains tax on primary housing price

The impact of the capital gains tax for second-hand housing deals on primary housing prices is different for short and long periods of time. For a short period, the capital gains tax can

negatively affect the primary housing price by reducing the primary housing demand. For a long period, the capital gains tax has no effect on the primary housing price.

5.2.2 The capitalization effect theory effect explaining the short period result

For a short period, according to the data analysis result, the capital gains tax has a negative effect on primary housing price. The change in the capital gains tax will also cause a change in primary housing demand. These two conclusions are consistent with the capitalization effect theory; due to the implementation of the capital gains tax, the investment demand in the primary housing market reduced because of the reduced amount of the expected return of investment. Then, as the demand for primary housing market reduced, the price of the primary housing market subsequently dropped (Ayers, 2007).

Besides, as discussed in Chapter 2, there also is an effect called the lock-in effect (Chen, 2013) which is also caused by the capital gains tax. The presence of lock-in effect is felt in the increasing price in the primary market via decreasing the secondary market supply. However, although the primary housing price in Wuhan continually increased during the short February 2013-September 2013 observation period, the increase was not caused by the lock-in effect. According to the results of both the Granger Causality Test and the panel data regression model, the capital gains tax cannot affect the secondary housing market nor has it had a positive effect on primary housing prices.

In conclusion, the adjustment of capital gains tax has had a negative effect on primary housing prices for a short period by decreasing the primary housing demand. This trend is consistent with the capitalization effect theory of the capital gains tax.

5.2.3 The housing market theory explaining the long period result

The results of both the Granger Causality Test and the panel data regression show that the capital gains tax cannot affect the primary housing price for a long period not only because of the capital gains tax's exemption and payers, but also because other factors have a more significant effect on the primary housing market.

Although the adjustment of the capital gains tax cannot affect the primary housing price for the long period, this does not mean that the other factors cannot affect the primary housing price. There are strong links between primary and secondary housing markets where the second-hand housing price has a significantly positive effect on the primary housing price. This is also consistent with housing market theory. In housing market theory, the relationship between the primary housing market and the secondary housing market is very close. Duffy (2005) stated that second-hand housing prices have an obvious impact on predicting primary housing market prices.

5.3 Answer to research question

"How does the 20 percent capital gains component of the income tax for secondary housing deals affect the stability of primary housing prices in Wuhan from 2013?"

The effect of the 20 percent capital gains tax for secondary housing deals on primary housing price is different for a short period and a long period. For a short period, the capital gains tax can stabilize the primary housing price. For a long period, the effect of the capital gains tax on primary housing price is insignificant.

5.3.1 The answer of sub-question 1

"What is the relationship between primary and secondary housing market in Wuhan after the adjustment of capital gains tax from March 2013 to June 2015?"

For a short period, after the adjustment of the capital gains tax, the relationship between the primary and secondary housing markets is quite close. The primary housing demand can affect primary housing prices and the second-hand housing demand can affect the primary housing supply. The capital gains tax can cause a change in primary housing demand and primary housing prices.

For a long period, the change in the primary housing market and the secondary housing market is not so close. Only the second-hand housing price can affect the primary housing price.

5.3.2 The answer of sub-question 2

"To what degree does the capital gains tax on the second-hand housing deals affect the primary housing price in Wuhan from February 2013 to March 2015?"

For a short period, the capital gains tax negatively affects the primary housing price; this shows that implementing a capital gains tax can effectively control increasing primary housing prices.

For a long period, the capital gains tax has no effect on primary housing prices.

5.3.3 The answer of sub-question 3

"How does the capital gains tax on second-hand housing deals operate in Wuhan?"

According to the survey of the active second-hand housing sellers, the taxpayers do not believe that the capital gains tax has had any effect; this resulted in the failure of capital gains tax for the long period. Meanwhile, their attitude and decision-making psychology also changed from the beginning to now and this also resulted in the failure of capital gains tax for the long period.

With the implementation of the capital gains tax, more and more second-hand housing sellers know how to meet the conditions for tax exemption and this could also result in the failure of capital gains tax for the long period.

5.4 Recommendations

5.4.1 Political recommendations

1. Although the capital gains tax can affect the primary housing price for only a short period, it still is an encouraging and worthy attempt. Everyone knows that solely relying on the market mechanism cannot solve the spontaneous defects of market regulation itself. Thus, the controlling policy of the government can not only give the market participants a warning, it can also give ordinary citizens confidence in the government. All in all, it is important for the government to continue to publish this kind of controlling policy to regulate and adjust the defective primary housing market.

2. Policy is not the only factor that can affect the primary housing price; other macro- and micro-economic factors can also affect the primary housing price. The government should also regulate other aspects of the economic environment in addition to focusing on the primary housing market. A more developed economic context can greatly reduce inefficient and ineffective market mechanisms.

5.4.2 Further research recommendations

1. Due to the short period following the newest adjustment of capital gains tax, this research only selected 26 months as the observation period. In general, 26 months is so short that it cannot accurate reflect the effect of the capital gains tax for second-hand housing deals on the

primary housing price. Hence, it is suggested that further research could select a longer observation period.

2. This research only selected one city, Wuhan, as the research subject but this geographic scale it is not sufficient for a thorough analysis of the impact of the capital gains tax on the primary housing price. Each city has its own characteristics, such as the different ways the local government implement the policy, different housing market consumer behaviour, different housing market activities, and different micro-economic environments. Therefore, if further research expects to conduct a full and detailed capital gains tax effect analysis, it would be better to choose more than one city to study.

3. This research did not consider other policy factors' impact on primary housing prices. However, in recent years both the national government and local government have issued more than one policy to control the primary housing price. Thus, it is also very important and essential for further study to take into account the different impact that policy factors have on primary housing price.

References:

Adam S. 2008. Capital gains tax. The IFS Green Budget.

Ayers, Lefanowicz, C. E. and Robinson, J. R. 2007. Capital Gains Taxes and Acquisition Activity: Evidence of the Lock-in Effect. Contemporary Accounting Research, 24 (2), pp. 315-344.

Bahl, R. and Wallace. 2008. Reforming the property tax in developing countries: A new approach. International Studies Program,.

Calza, A., Monacelli, T., & Stracca, L. 2013. Housing finance and monetary policy. Journal of the European Economic Association, 11(s1), 101-122.

Cao G., Yang Q., 2008. The thinking about primary housing price determining factors. Chinese Collective Economics. pp. 12-18.

Cook,Gu, C. and Halsall, J. 2013. China's low income urban housing. Asian Social Science, 9 (3), pp. 7-17.

Dai, Maydew, Shackelford, and Zhang.2008. Capital gains taxes and asset prices: capitalization or lock-in? The Journal of Finance, 63 (2), pp. 709-742.

Deng, W. and Song, Y., 2008. Housing economics. Tsinghua University.

Duffy, Gerald, and Kearney, I. 2005. Rising house prices in an open labour market. The Economic and Social Review, 36 (3), pp. 251-272.

Ebrill, L. P., 2001. The Modern VAT. INTERNATIONAL MONETARY FUND.

Fainstein S.2012. Land value capture and justice. Ingram, G. and Hong, Y. eds.

Fan,J., & Shao T. 2011. Housing price, location of diversified product and urban system. Economic Research Journal, 2, 87-99.

Francese, P., 2003. The second home boom. American Demographics, (6),.

Gallin, J., 2006. The long-run relationship between house prices and income: evidence from local housing markets. Real Estate Economics, 34 (3), pp. 417-438.

Gao, T. 2009. The economitric analsis: based on Eviews. Beijing: Tsinghua University press.

Ge, L. and Xu, D. 2007. The analysis of the interaction between the primary and secondary housing market. Economic Review, (3), pp. 107-109.

Graham, J., 2003. Taxes and corporate finance: A review. Review of Financial Studies, 16 pp. 1075-1129.

Granger C W J.1988. Some recent development in a concept of causality. Journal of econometrics, 39(1): 199-211.

Guo, S. and Hardin III, W. G. 2014. Wealth, Composition, Housing, Income and Consumption. The Journal of Real Estate Finance and Economics, 48 (2), pp. 221-243.

Hong Y H, Brubaker D.2010. Integrating the Proposed Property Tax with the Public Leasehold System. China's Local Public Finance in Transition, pp.165-90.

Hong, Y. and Yi, C. 2012. Patterns of second-home ownership in Chinese cities. In: Y. Man ed., 2012. China's housing reform and outcomes. The Unitied States of America: The Lincoln Institute of Land Policy. pp. 89-106.

Hou, X., 2011. Research on Controlling Effect of Taxation Policies in the Second-hand Housing Market of China. Liaoning University.

Hulchanski, J. D. (1995). The concept of housing affordability: Six contemporary uses of the housing expenditure‐to‐income ratio. Housing studies, 10(4), 471-491.

Hwang, M. and Quigley, J. M. 2010. Housing price dynamics in time and space: predictability, liquidity and investor returns. The Journal of Real Estate Finance and Economics, 41 (1), pp. 3-23.

Kane, T. J., Riegg, S. K., & Staiger, D. O. (2006). School quality, neighborhoods, and housing prices. American Law and Economics Review, 8(2), 183-212.

Khan, Y., 2013. Capital Gains Tax - An Introduction. Credit Control, 34 (2), pp. 20.

Kwiatkowski D, Phillips P C B, Schmidt P, et al. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root. Journal of econometrics, 54(1): 159-178.

Kwoun, Lee, Kim, and Kim. 2013. Dynamic cycles of unsold new housing stocks, investment in housing, and housing supply-demand. Mathematical and Computer Modelling, 57 (9-10), pp. 2094-2105.

Li, W. and Song, B. 2009. Relationship of housing price and trade volume: An explanation based on dynamic stock flow model. Urban Studies, 16 (3), pp. 61-66.

Liu, S. and Zhao, X. 2012. The interaction among primary, secondary, and affordable housing market. Social Sciences Review, 27 (12), pp. 50-51.

MacKinnon J G.2010. Critical values for cointegration tests[R]. Queen's Economics Department Working Paper.

Masnick, G., 2002. The new demographics of housing. Housing Policy Debate, 13 (2), pp. 275-321.

Meen, G., 2011. A Long-Run Model of Housing Affordability. Housing Studies, 26 (7), pp. 1081-1103.

Mushtaq R.2011. Augmented Dickey Fuller Test.

Nathan D, Sarkar S.2011. Blood on Your Mobile Phone? Capturing the Gains for Artisanal Miners, Poor Workers and Women. Capturing the Gains for Artisanal Miners, Poor Workers and Women (February 23, 2011).

National Bureau of Statistics of China ed., 2014. China Statistical Yearbook
\China Statistical Yearbook;China Statistical Yearbook; China Statistic Press.

Newell, Chau, Wong, and McKinnell. 2005. Dynamics of the direct and indirect real estate markets in China. Journal of Real Estate Portfolio Management, 11 (3), pp. 263-279.

Ojede, A., & Yamarik, S. (2012). Tax policy and state economic growth: The long-run and short-run of it. Economics Letters, 116(2), 161-165.

Pietola, Myyrä, S. and Pouta, E. 2012. The Effects of Changes in Capital Gains Taxes on Land Sales: Empirical Evidence from Finland. Land Economics, 87 (4), pp. 582-594.

Shen, J., 2002. A Study of the Temporary Population in Chinese Cities. Habitat International, 26 (3), pp. 363-377.

Shiller R J. 2005. Comparing wealth effects: the stock market versus the housing market. Advances in macroeconomics, 5(1).

Smolka, M. O., 2013. Implementing Value Capture in Latin America: Policies and Tools for Urban Development. Lincoln Institute of Land Policy.

The Institute of Social Science Survey of Peking University ed., 2012. China development report of people's well-being. Beijing Normal University Press.

The Ministry of Construction, 1994. The regulation of second hand housing and affordable housing for sale.

The State administration of Taxation, 2013. National 5 Regulations.

Walters, L. C., 2012.
Are Property-Related Taxes Effective Value Capture Instruments? In: G. K. Ingram and Y. Hong eds., 2012. Value capture and land policies. The United States of America: the Lincoln Institute of Land Policy. pp. 187-216.

Wang, M., 2000. Social and spatial implications of housing reform in China. International Journal of Urban and Regional Research 24 (2) pp. 397-417.

Wang, M., 2012. The China Housing System Reform: Review and Rethinking. Lan Zhou Xue Kan, (07), pp. 137-143.

Wilhelmsson, M. (2008). House price depreciation rates and level of maintenance. Journal of Housing Economics, 17(1), 88-101.

Wooldridge J.2012. Introductory econometrics: A modern approach[M]. Cengage Learning.

Zhang, X., 2007. Eviews guide and case. Press of machinery industry.

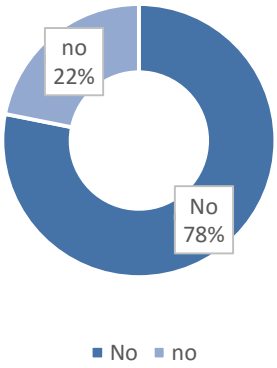
Zhang, Y. and Wang, Z. 2014. Discussion about the 20% individual income tax transfer issue. Modern Economic Research, 2 pp. 23-27.

Zhong, W., 2012. The analysis of impact of the new second-hand housing individual income tax. Economic Herald, 11 pp. 65-66.

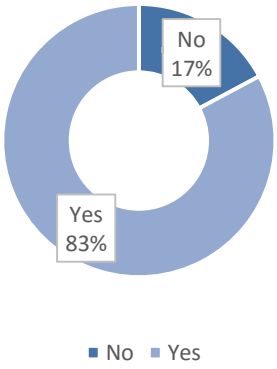
Zhu, B. Füss, R. and Rottke, N. B. 2013. Spatial Linkages in Returns and Volatilities among U.S. Regional Housing Markets. Real Estate Economics, 41 (1), pp. 29-64.

Annex 1 the result of questionnaire

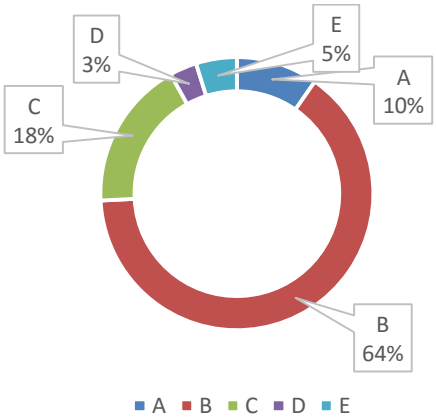
1. Is your selling second-hand house is the only property of your family?



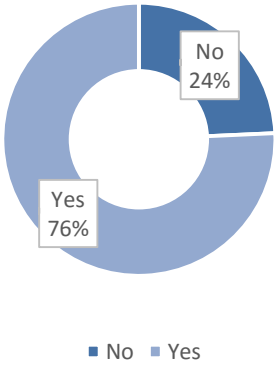
2. Is your selling second-hand house is older than 5 years?



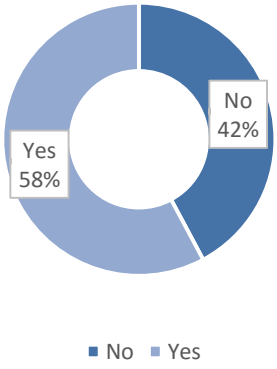
3. The reason why you decide to sell your house?
   A. Urging to need money
   B. Improving life quality
   C. Professional speculator
   D. Normal Investor
   E. Other, for example?



4. Do you know the capital gains tax on second-hand housing transaction?



5. Do you believe in that this capital gains tax can affect the primary housing prices?



Annex 2 The panel data regression result from 26 months to 3 months

Table 26 The panel data regression result from 26 months to 22 months (Source: the author based on Eviews)

	26 months	**25 months**	**24 months**	**23 months**	**22 months**
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
CGT	-2.7408	-3.808689	-3.415254	-3.405754	-3.913518
	(2.7006)	(3.245198)	(3.056317)	(2.722639)	(3.256352)
SP	0.7054***	0.783733***	0.869212***	1.001546***	0.956829***
	(0.1673)	(0.191204)	(0.191918)	(0.162271)	(0.165192)
CPI	3.134912*	-26.03216	-16.89667	-10.92705	-11.58194
	(1.42051)	(16.38494)	(15.46313)	(13.64639)	(16.08597)
I	0.628258*	0.851128*	0.636963	0.443307	0.287686
	(0.30809)	(0.401953)	(0.362549)	(0.311373)	(0.321416)
GDP	7.0951	9.074393*	9.451668*	8.26083*	5.154307
	(4.3713)	(3.907605)	(3.713642)	(4.024676)	(4.319999)
CC	3.134912*	0.900816***	0.84131***	0.740134***	0.335962
	(1.42051)	(0.245985)	(0.236936)	(0.199871)	(0.240388)
POP	0.001688	0.000579	-0.000819	-0.002953	-0.002199
	(0.00121)	(0.001996)	(0.002224)	(0.002024)	(0.001955)
IR	19.3803	-0.004717	-0.010579	-0.012425	-0.035049
	(25.3083)	(0.03159)	(0.031525)	(0.02807)	(0.057414)
MR	-0.80732	-62.20251	-108.6448	-219.9405**	3.892706
	(70.3907)	(104.3034)	(114.6889)	(70.00864)	(135.1024)
C	7.095094*	1607.838	1795.607	3039.212	2223.439
	(3.30434)	(2132.926)	(2123.159)	(1948.95)	(1964.666)
R-squared	0.927861	0.927615	0.927722	0.930148	0.939964

Table 27 The panel data regression result from 21 months to 17 months (Source: the author based on Eviews)

	21 months	20 months	19 months	18 months	17 months
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
CGT	-3.8515	-3.857427	-4.449345	-4.78406	-6.321661
	(3.045668)	(3.547068)	(3.594437)	(3.828849)	(3.822209)
SP	0.935651***	1.11984***	0.931166***	0.942694**	0.890764**
	(0.155019)	(0.206263)	(0.274394)	(0.286138)	(0.282946)
CPI	-13.72965	-5.702321	-9.746213	-9.878418	-20.46482
	(14.87641)	(19.68114)	(20.10762)	(20.63001)	(21.00223)
I	0.310564	0.199204	-0.126223	-0.145394	0.15174
	(0.297806)	(0.438348)	(0.485879)	(0.502441)	(0.526986)
GDP	4.47832	7.1799	13.6892	13.21977	8.974175
	(4.099904)	(5.513812)	(7.633804)	(7.852456)	(8.371896)
CC	0.401999	0.636654	1.093726*	1.057191*	0.888678
	(0.21944)	(0.327805)	(0.502029)	(0.517129)	(0.533504)
POP	-0.001909	-0.001779	-0.00191	-0.002038	-0.001014
	(0.001886)	(0.002003)	(0.002093)	(0.002227)	(0.002292)
C	2225.826	835.2799	1157.559	1287.587	1896.266
	(1874.855)	(2301.756)	(2315.095)	(2402.432)	(2470.33)
R-squared	0.948657	0.939028	0.939974	0.937851	0.939185

Table 28 The panel data regression result from 16 months to 12 months (Source: the author based on Eviews)

	16 months	**15 months**	**14 months**	**13 months**	**12 months**
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
CGT	-6.326541	-6.766639	-5.80536	-3.810682	-5.596598
	(3.814471)	(3.961517)	(4.045488)	(3.240478)	（3.992582）
SP	0.938823**	0.899745*	0.879392*	1.048411**	0.414286
	(0.289498)	(0.346111)	(0.383761)	(0.358027)	（0.227371）
CPI	-21.8287	-28.42932	-27.09285	-12.49256	-33.07088*
	(21.12304)	(24.4492)	(24.88323)	(25.2262)	(15.84647)
I	0.309781	0.639428	0.877314	0.891479	0.846951*
	(0.607392)	(0.758261)	(0.862541)	(0.69131)	(0.375155)
GDP	5.95272	2.408452	0.025601	-3.164172	0.958081
	(9.958348)	(10.48384)	(10.87691)	(7.439634)	(4.573445)
CC	0.725402	0.604953	0.51952	0.261316	0.664043
	(0.6099)	(0.623969)	(0.629835)	(0.391093)	(0.229664)
POP	-0.001654	-0.001879	-0.000206	0.002391	-0.002231**
	(0.002429)	(0.002715)	(0.003022)	(0.003209)	（0.001123）
C	2511.025	3408.194	2269.801	-771.5445	4635.433**
	(2552.558)	(2812.341)	(2928.702)	(2634.915)	（1624.571）
R-squared	0.939637	0.938811	0.938943	0.937844	0.933242

Table 29 The panel data regression result from 11 months to 7 months (Source: the author based on Eviews)

	11 months	**10 months**	**9 months**	**8 months**	**7 months**
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
CGT	-4.664206	-5.306839	-5.797023	-7.30806*	-7.666401**
	（3.072119）	（3.618334）	（4.030072）	(3.05595)	（2.276345）
SP	0.561111***	0.631106***	0.670218*	0.79600***	0.901627
	（0.153466）	（0.074125）	（0.265125）	(0.05755)	（0.471572）
CPI	-40.15138*	-41.70972*	-51.96603	-59.26433***	-112.0426**
	（16.56943）	（16.61932）	（27.63056）	(16.76457)	（39.82238）
I	0.636758	0.736189	1.682883*	1.14600**	4.083074*
	（0.466618）	（0.436746）	（0.717023）	(0.39924)	（1.562712）
GDP	3.576546	2.447396	-8.062171	-1.68618	-18.41791**
	（6.539475）	（6.861323）	（6.820406）	(5.965356)	（6.735567）
CC	0.824171**	0.76665**	0.328915	0.58211**	0.24274
	（0.285523）	（0.261159）	（0.26178）	(0.24789)	（0.349272）
C	3605.907*	3702.696*	4894.791	5334.340**	9945.239*
	（1705.293）	（1732.173）	（2918.638）	(1685.404)	（3779.369）
R-squared	0.984526	0.984995	0.95639	0.983095	0.963745

Table 30 The panel data regression result from 6 months to 3 months (Source: the author based on Eviews)

	11 months	**10 months**	**9 months**	**8 months**
	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)	Coefficient (Std. Error)
CGT	-10.83538***	-7.650152*	-4.05078*	-1.385012*
	（2.85217）	(2.784804)	（1.802672）	（0.450352）
SP	-0.212981	-0.30081	-0.5285	-0.158684
	（0.144145）	(0.161591)	（0.375394）	（0.252312）
CPI	-153.3122***	-80.89523**	-40.35483	-102.0228*
	（37.50694）	(28.43028)	（42.06403）	（33.74743）
I	4.925284**	2.346532**	0.088935	3.764563*
	（1.374847）	(0.841613)	(1.610015）	（1.437842）
GDP	-21.03047**	-19.71254*	5.482068	0.293853
	（7.122802）	(8.679274)	(6.103797)	（1.233267）
CC	0.615388*	-0.060862	0.886362	1.435077*
	（0.28425）	（0.537035）	(0.692644)	（0.473475）
C	14938.24***	9383.416***	5188.785	9022.138**
	（3408.507）	(2504.679)	（3269.207）	(1685.404)
R-squared	0.971279	0.976372	0.994644	0.997664

Annex 3 The result of unit root test for panel data regression

Table 31 The result of unit root test in short period (Source: the author based on Eviews)

Null hypothesis: unit root process exists.					
Variable	Method	Statistic	Prob.	Cross-sections	Obs
CC1	Levin, Lin & Chu t	-3.29910	0.0005	8	56
CGT1	Levin, Lin & Chu t	-16.2096	0.0000	8	56
CPI1	Levin, Lin & Chu t	-52.4736	0.0000	8	56
GDP1	Levin, Lin & Chu t	-2.17437	0.0048	8	56
PP1	Levin, Lin & Chu t	-3.88002	0.0001	8	56
SP1	Levin, Lin & Chu t	-6.69551	0.0000	8	56
I1	Levin, Lin & Chu t	-6.06407	0.0000	8	56
POP1	Levin, Lin & Chu t	N/A	N/A	8	56
IR1	Levin, Lin & Chu t	N/A	N/A	8	56
MR1	Levin, Lin & Chu t	N/A	N/A	8	56

Table 32 The result of unit root test in long period (Source: the author based on Eviews)

Null hypothesis: unit root process exists.					
Variable	Method	Statistic	Prob.	Cross-sections	Obs
CGT2	Levin, Lin & Chu t	-3.6240	0.0001	8	80
SP2	Levin, Lin & Chu t	-3.3343	0.0004	8	80
CC2	Levin, Lin & Chu t	-7.4738	0.0000	8	80
MR2	Levin, Lin & Chu t	-2.17437	0.0048	8	80
CPI2	Levin, Lin & Chu t	-5.3477	0.0000	8	80
IR2	Levin, Lin & Chu t	-3.4513	0.0308	8	80
I2	Levin, Lin & Chu t	-2.0513	0.0201	8	80
PP2	Levin, Lin & Chu t	-2.0106	0.0222	8	80
POP2	Levin, Lin & Chu t	-3.9841	0.0332	8	80
GDP2	Levin, Lin & Chu t	-2.1263	0.0167	8	80

Annex 4 The result of VIF test

The criteria of VIF method is as below:

If :

$0 < VIF < 10$, no multi-collinearity;

$10 \leq VIF < 100$, strong multi-collinearity;

$VIF \geq 100$, Severe multi-collinearity.

Table 33 the result of VIF test in short period (Source: the author based on Eviews)

Variable	VIF	1/VIF
GDP1	7.70	0.129802
CC1	4.88	0.204913
I1	4.34	0.230156
CGT1	2.98	0.335589
CPI1	2.31	0.433110
SP1	2.27	0.440056
Mean VIF	3.71	

Table 34 the result of VIF test in long period (Source: the author based on Eviews)

Variable	VIF	1/VIF
I2	3.47	0.287821
MR2	3.41	0.293038
IR2	2.41	0.414810
GDP2	2.39	0.418774
SP2	2.06	0.485153
CGT2	1.78	0.562059
CC2	1.53	0.655258
CPI2	1.37	0.732321
POP2	1.33	0.750367
Mean VIF	2.19	