ABSTRACT

The Determinants of Chinese Housing Price Inflation

Fangshi Lin, M.S.

Mentor: H. Stephen Gardner, Ph.D.

Housing prices in major Chinese cities have been soaring since 2003. Some economists believe that this represents a dangerous speculative bubble while others argue that Chinese housing price inflation is a normal consequence of supply and demand adjustments in a rapidly-developing economy. This study attempts to explain the movement of housing prices in 35 large and medium-sized Chinese cities between 2002 and 2010.

Here, we review many of the causal relationships that have been explored in previous research, but we uncover some interesting evidence on the financial side of the Chinese housing market that has received little attention in previous studies. We find, for example, a reciprocal relationship between local housing prices and the revenues of local governments. A strong housing market provides rising revenues for a local government, and rising revenues, along with personal saving, seem to feed back into the financial base of the local housing market.

The Determinants of Chinese Housing Price Inflation

by

Fangshi Lin, B.A., M.S.

A Thesis

Approved by the Department of Economics

_____

H. Stephen Gardner, Ph.D., Chairperson

Submitted to the Graduate Faculty of
Baylor University in Partial Fulfillment of the
Requirements for the Degree
of

Master of Science in Economics

Approved by the Thesis Committee

_____

H. Stephen Gardner, Ph.D., Chairperson

_____

Joseph A. McKinney, Ph.D.

_____

Thomas M. Kelly, Ph.D.

_____

James E. West, Ph.D.

_____

Xin Wang, Ed.D.

Accepted by the Graduate School

December 2012

_____

J. Larry Lyon, Ph.D., Dean

Page bearing signatures is kept on file in the Graduate School.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

I would like to thank Dr. Gardner for his assistance. He provided invaluable support and guidance along with using his extensive network of academic connections to help me construct and build further upon my thesis. He has spent a lot of time in discussing results with me and helped me to extend my ideas during the whole process. I would also like to thank Dr. James West and Dr. Scott Cunningham for their support in data analysis and thank the rest of my committee, Dr. Joseph McKinney, Dr. Xin Wang and Dr. Tom Kelly for their support and input throughout this project.

CHAPTER ONE

Introduction

Following the economic reforms that began in the 1970s, China has experienced exponential growth of national income, rising from 3.65 billion RMB in 1978 to 401.2 billion RMB in 2010 (NSBC, 2011). Land reform and housing privatization are among the major policies that have generated enormous change in the real estate market. Individuals have gained easier access to housing and can trade property with greater freedom. Commercial construction has been soaring and housing prices have escalated in China's major cities. Although overall poverty is declining, the number of urban poor has grown substantially (He and Wu, 2010). So housing affordability has become a serious issue in cities that have attracted large migrant populations. Shortages of subsidized housing have contributed to poor living conditions for migrants (Tian, 2008). Urban villages (*Chengzhongcun*), which attract rural migrants by providing affordable rents in unregulated housing, have become common in South China (ibid). The dramatic growth of housing prices has contributed to an enormous redistribution of wealth in China, enlarging the gap between the rich and the poor.

The rise of the Chinese housing market has also generated commercial and employment opportunities in basic material, construction, interior decoration, and real estate service sectors (Ahuja, 2010). It is also a key source of government revenues. If these incomes are associated with an unsustainable real estate bubble, as some have suggested (Chen and Funke, 2011), its collapse could negatively affect the general

economy. Thus, the national government has introduced several measures that are intended to prevent local real estate markets from overheating.

The housing market has created income disparities not only between individual households, but also between the inland and coastal regions of the country. This is a problem, in part, because it may cause an imbalanced migration between the provinces.

Housing price inflation also contributes to many other socio-economic problems. For example, for many young people in China, ownership of a personal apartment (living separately from one's family) is an essential prerequisite for marriage. Reported from Huang (2012):

> *"In China, if you don't have a house, no girl will want to be with you," said Hua Zhu, who recently graduated from Shanghai Jiao Tong University. "For a guy, it's of course not fair, but it's the way society works."*

As real estate prices rise, many young men cannot afford houses by themselves, and only the sons of relatively rich families can own apartments at a young age. The connection between expensive housing and marriage contributes to a general sense of discontent among the younger generation.

This study aims to examine which factors raised housing price over time and across cities, focusing the experience between 2002 to 2010 in 35 large and medium-sized cities in China. We consider some factors that have gained little attention in previous studies, such as local government revenues, migration rates and urbanization levels. We find a reciprocal relationship between local housing prices and the revenues of local governments, suggesting that housing sales provide rising revenues for a local government, and that rising revenues, along with personal savings, contributes to the financial base of the local housing market. Intercity migration seems to have little

influence on housing prices, because most of the migrants are not to be able to participate in housing markets. Overall urbanization levels, influenced by the local systems of household registration, do not seem to have a significant influence on housing price trends.

This study is organized as follows: In the literature review chapter, we will survey the determinants of housing prices that have been examined in previous research. In Chapter Three, we will provide background information on some of the unique institutional characteristics of the Chinese real estate market, and then, drawing on that information, we will develop a theoretical framework for our analysis and a set of research hypotheses. Chapter Four will provide information about the special database that we have constructed for this analysis. Chapter Five will provide an explanation of our statistical methodology and empirical result. A concluding chapter will provide suggestions for future research.

CHAPTER TWO

Literature Review

Since the urban residential housing in urban China has grown more commercialized since the late 1980s, housing prices has grown exponentially at an annual growth rate of 11.3 percent (Niu and Chow, 2009). Many scholars have attempted to determine whether this represents the growth of an unsustainable housing bubble. Niu and Chow (2009) found that basic forces of supply and demand rather than speculation can explain urban housing prices. They also find no evidence of a housing bubble on their sample (ibid). On the other hand, Chen (2011) utilized a fad-bubble regime-switching model to analyze the property market by decomposing housing price into fundamental and non-fundamental parts. The fundamental price is determined by supply and demand in an efficient market while the non-fundamental price is equal to the bubble size (ibid). Chen (2011) provides some evidence of a speculative housing bubble in some Chinese cities, mainly caused by rapid growth of gross domestic product and income levels. Yu (2011) employed data from 35 large and medium sized cities to examine the Chinese housing market, finding that irrational bubbles are evident in most of the 35 cities because of the increasing purchasing power. The big housing bubbles are concentrated in the coastal regions owing to development disparities between inland and coastal cities.

Several studies find that the overheating of real estate market contributes to inequalities of income and wealth. Kosareva and Struyk (1993) find the potential for a substantial redistribution of wealth to individual households during the process of

housing privatization. Huang and Jiang (2009) conducted a case study on Beijing to examine urban housing inequalities. Their findings suggest that housing inequality is significant related to inequalities in institutional and socio-economic status. They also find that local non-agricultural residents who changed residential apartments in the last five years had access to the best housing (ibid). Logan and Fang (2010) found that urban migrants obtained higher quality housing in destination cities than urban natives. The study of Chen, Stephens and Hao (2009) focused on Shanghai to examine the recent housing affordability. They found that 80 percent of Shanghai residents experienced a reduction in home purchasing power over 1999-2008 after housing reform. In addition, they concluded that privatized housing remains unapproachable for the majority of households (ibid).

Several studies have explored determinants of housing prices in major Chinese cities. For instance, Zheng and Kahn (2009) provide evidence that bigger cities shave higher housing prices. Their research also indicates that cities obtaining favorable government policies have much more expensive housing than others. Yiu (2010) suggests that the lack of investment vehicles and dramatic growth of investment demand have led to housing bubbles in Chinese cities. Yiu also claims that the monetary policies of the central government play an important role in housing price inflation.

Some researchers include population as an explanatory variable and find a positive correlation between housing prices and population. For example, Wang and Zhang (2012) provide evidence that urban Hukou population is highly correlated with housing price appreciation in urban China. On the other hand, some of the empirical results of Tian (2007) suggest a negative relationship between population growth and

housing price inflation. Wang and Yang (2010) find that increasing income and economic openness are important determinants of housing prices. They find that the urban economic openness is responsible for 15.9 percent of real estate appreciation from year 1998 to 2006 in 35 primary Chinese cities. Moreover, Zhang and Wei (2011) suggest that there may be some influence of sex ratios on housing markets through marriage markets. However, Zhang and An (2012) suggest that it is the excessive money poured into the real estate market that raises prices rather than the marriage competition. Guo and Chen (2010) utilize panel data from 1995 to 2005 to examine the effects of urbanization level and migration on real estate market.

Yu (2011) claims that the irrational housing bubbles may be explained by frequent and unpredictable interventions of the Chinese government. Wang and Chan (2012) find that the Chinese government has been unusually restrictive in its approvals for housing construction and land transactions, but it has allowed a more rapid growth of urban construction from 1998 to 2009 in 35 major cities.

Here, we are interested in the determinants of housing price disparities across Chinese major cities and factors that have led to exponential price trends. We use a panel dataset for 35 large and medium sized cites from 2002 to 2010 to explore several hypotheses related to the housing market. In distinction from prior studies, we extend our research to include government revenue to examine the role of local governments in the housing market. We also attempt to explore the influences of migration and personal savings stocks on real estate market.

CHAPTER THREE

Chinese Specific Characteristics: a Theoretical Framework

In addition to the traditional factors that influence the markets for real estate in other market economies, the Chinese economic system includes several unique features that influence the demand and supply of housing. These include the systems of household registration, home ownership, use rights for land, and local collection of revenue. All of these systems have changed enormously during the reform era that began in 1978, and most of them are continuing in their evolution.

The Hukou System

The Hukou system, which is the household registration system in China, places limits on internal migration, indirectly affecting housing demand in each city. Here, we will survey the evolution and reform of the Hukou system.

The system was created in the 1950s to secure social and political order and to consolidate the socialist system and public interests. During that period, the state was the monopoly supplier of food and many other resources. To facilitate central planning and to distribute resources effectively, it was considered necessary to establish a mechanism to control population growth in each location. From this perspective, the Hukou system played an important role in restraining free residential mobility.

Under the Hukou system, each person has a dual classification: Hukou location (*hukou suozaidi*) and Hukou category -- agricultural (rural) or non-agricultural (urban) Hukou (*Hukou leibie*). Both of these designations are inherited on the basis of the

mother's status (Wu, 2011). The registered Hukou location constrains where people can obtain social benefits and resources provided by the central government. The monopoly distribution of necessities made it difficult for people to live outside their Hukou location. Until the 1980s, rural households found it difficult to survive in urban areas for this reason. Conversion of Hukou registration was a personal decision, but it required dual approval, changing the registered place and the registered status. Approval of a change from agricultural to non-agricultural Houkou was governed by two factors: "policy" (*zhengce)* and "quota" (*zhibiao*). "Policy" refers to a changing set of criteria that were applied when people wished to convert from agricultural status to non-agricultural status while the "quota" refers to the total number of conversions allowed. Under the dual control system, the Hukou system tightly constrained population mobility and functioned like a domestic passport (Wu and Rosenbaum, 2008).

Hukou system reforms were made necessary by the considerable economic and social changes that began in the 1970s. As the economy became less centralized and more market-oriented, labor demand in urban areas increased dramatically and unequally. Rapid economic development led to a significant rise in population mobility, requiring reforms of the Hukou system.

Since the 1980s, various measures have been employed by the central government to relax the Hukou policy. The issue of "temporary residence permits" has provided opportunities for migrants with agricultural Hukou to work in urban China. Between 1982 and 2005, the population with non-agricultural Hukou increased from 14.6% to 26.1% percent. The proportion of people residing in urban areas with rural Hukou grew from 6.2% in 1982 to 21.4% in 2005 (Wu, 2011).

As the central government adopted a more decentralized policy, local governments gained more autonomy to regulate population movement. Some regional governments began to sell Hukou to migrants to generate revenues. A new category of "blue stamp" Hukou was sold to migrants in some cities beginning in 1992, opening new opportunities for relatively wealthy people to relocate. It became possible for domestic Chinese who invested in a city to obtain a local Hukou, attracting new financial resources into the cities.

Local governments were required to ensure equal political rights and obligations for the "blue stamp" Hukou holders. Permission to obtain a "blue stamp" urban Hukou is extended to "persons and their close relatives who, with permission, purchase urban housing at market prices or build urban housing by their own capital." Hence, a family that wants to enjoy privileges in a particular city, such as education and medical care, can simply purchase an apartment in that location. For example, many parents have purchased apartments in Beijing and Shanghai for their children to have preferential access to enrollment in the top universities. This phenomenon is known as Gaokao (Chinese university entrance examination) migration.

Owing to ongoing reform of the Hukou system, residential mobility has increased considerably. According to the Chinese Bureau of Statistics, the number of people with current residences that are different from their initial household registrations grew by about 81 percent between 2000 and 2011.

Housing Reform

The housing tenure structure in urban China is quite different from that in other countries and has changed dramatically during the past 50 years (Huang and Clark, 2001).

Between 1949, the founding year of the People's Republic of China (PRC), and 1979, the Chinese real estate market was completely centrally-planned with the central government acting as a monopoly owner and supplier (Jin, 2011). During this period, no private housing existed and most people in urban China obtained apartments from the public housing system (Chen, 2010). State budgetary funding supported housing developments and the established housing units were distributed to individuals through their work units (called Danwei in Chinese) (Wu, 2010). The state distributed housing funds to work units according to their importance in the national economy. This was indicated by the administrative rank of the work unit (Wu, 1996). The higher the rank of the unit, the more funding it obtained (Huang and Clark, 2001).

Within work units, housing was allocated according to job rank and seniority. Employees with higher job positions and longer job seniority were more likely to have access to public housing and to receive a larger housing size (ibid). Moreover, the household registration system served as an additional filter. Only households with permanent urban hukou were considered for housing provision by the state.

Since the 1980s, China has adopted a series of economic reforms and the urban housing structure reform has been an essential component (Li, 2011). Several coastal cities were selected as pilot areas to test the practicability of housing privatization (Wang & Murie, 2000a). This trial led to the emergence of a private housing market, which became known as “commodity housing units” in China. Developers were allowed to build commercial housing, initially at a slow pace to meet the needs of foreigners and employees working in non-state-owned entities (Li, 2011). In addition, a number of

publicly-owned housing units were sold at deeply discounted prices to their current tenants (Deng, Shen & Wang, 2009).

Since 1988, the central government has strongly encouraged the extension of private housing and home-ownership, but has retained ultimate ownership of urban land (Huang and Clark, 2001).

During the 1990s, various housing reform measures and policies were employed to accelerate development of the private housing market. First, the central government provided additional encouragement to individual households to buy apartments from their work units at rates much lower than the market prices. Second, the central government tried to reduce the subsidies that it provided to state enterprises that provided low-cost housing to their workers (Chen and Hao, 2010). In 1998, work units completely stopped providing residential housing for their employees. Instead, housing benefits were integrated into salaries, and individual households had to purchase or rent housing units in the private housing market (Wu, 2010).

More recently, to improve the living conditions of middle- and low-income families, the central government has initiated an affordable housing project that aims to improve the accessibility of reduced-cost housing (Y. Wang, 2004; Yang & Shen, 2008). By the end of the 2000s, a dual-housing system was established to meet the needs of high-income people with commercial housing and to provide the middle and low income households with affordable housing (Li, 2011).

To compensate employees for termination of housing provision, the government established the Housing Providence Fund, (called *zhu fang gong ji jin* in Chinese) (Yang, 2009). The Fund was launched together with the reform of the salary system (Duda,

2005). Instead of providing employees with housing and paying relatively low salaries, this project increased salaries and allocated part of the increase into special household savings' accounts housing purchases (Li, 2011). This reform induced households to search for residences in the private housing market and therefore reduced the state's responsibilities of housing finance (Lee, 2000).

Work units with more funding are able to build additional housing or purchase commodity housing from the market. These are sold to employees at highly subsidized prices. The distribution of these salary-based housing subsidies is still based on institutional factors, such as position rank and job seniority. Households in the same work unit may receive different price discounts in subsidized housing according to their job seniority (Huang and Clark, 2001).

Hence, the current urban housing system in China is quite complicated, including various forms of public and private housing. Households are free to choose between public and private housing, and between renting or purchasing in the housing market (Huang and Clark, 2001).

Land Use Rights

In any country, the market for housing is closely related to the market for land. The relationship is somewhat different in the Chinese case, however, because the socialist system has placed special limitations on the system of land ownership. According to Article 10 of the Chinese Constitution:

> *Land in the cities is owned by the state. Land in the rural and suburban areas is owned by collectives except for those portions which belong to the state in accordance with the law; house sites and private plots of cropland and hilly land are also owned by collectives. The state may in the public interest take over land for its use in accordance with the law. No organization or individual*

> *may appropriate, buy, sell or lease land, or unlawfully transfer land in other ways. All organizations and individuals who use land must make rational use of the land.*

Although the state preserves the ultimate ownership of land, individuals and organizations can be granted the right to use land for a certain period of time.

There are two types of land use rights: allocated land use rights and the granted land use rights (Liao, 2011). Land use is *allocated* for specific purposes, such as for State administration or military purposes; while land use is *granted* for more general purposes, such as commercial offices and residential housing (Liao, 2011). The government provides allocated land use rights for indefinite periods of time without a required payment (although it may require the recipient to cover the cost of resettling and compensating existing residents). Thus, allocated land use rights are primarily available to government entities and units affiliated with the government (Chen, 2010).

In contrast, granted land use rights require the payment of a premium, called the land grant fee. The land premium is determined by the property value of the land tenure, determined by the length of tenure and the price of comparable land (Chen, 2010). Granted land use rights are subject to time limits that are based on the intended land use -- 70 years for residential uses, 50 years for industrial or mixed uses, and 40 years for commercial uses (Wu, 2010).

In a typical private housing project development process, local governments first sell land use right of parcels to developers (Chen and Guo, 2010). The developers must pay the fees for granting land use rights, agreed with local land offices in the granting contracts (Liao, 2010). The developers then establish housing units on the parcels and sell them to households. Households are able to live in, rent out, or sell their housing

units during the effective period of the contract (Chen and Guo, 2010). Afterward, the ability of the tenant to extend the contract is far less clear (Wu, 2010). Chen (2010) has also discussed the problem of the extension of the granted land use rights after expiration of the contract.

Another issue regarding the granted land use right relates to the government revenue, because the premiums paid land use rights are distributed between the central and local governments (Chen, 2010). Nature (2012) finds that land grant fees are directly linked to the local government revenue and therefore the government has strong incentives to develop and encourage as much land use as possible. The generated land premiums represent a large share of local government (Chen, 2010). According to the Ministry of Finance (2009), land use fees account for almost half of the total provincial expenditure.

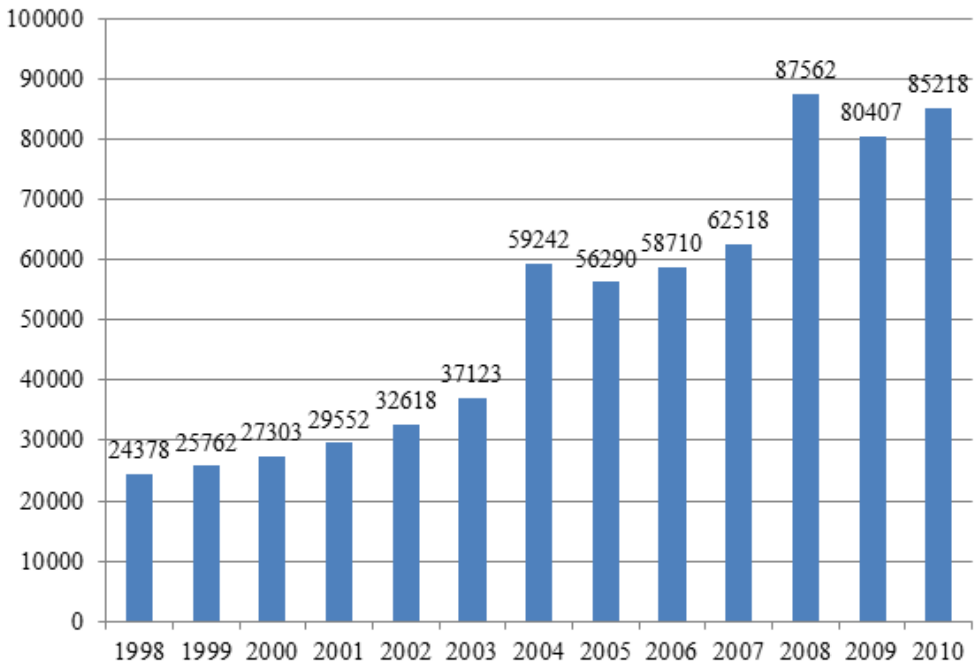

Figure 3.1. The number of enterprises for real estate development in national level, 1998-2010. *Source:* NBSC 2011

Nature (2012) as well indicated that local governments highly depend on the land grant fees. Between 1987 and 2006, income generated from land sales grew from less than 0.1% to 35% of the total government revenue (ibid). State-owned enterprises are more likely to obtain better parcels with the highest prices (Wu, 2010).

Its dynamic growth has also changed the institutional structure of the real estate market. Displayed in Figure 3.1, between 1998 to 2010, the total number of housing developers more than tripled from 24378 to 85218.

Government Policy

The Chinese government has introduced a variety of policies to respond to potential housing bubbles and to curb overheating of the housing industry in recent years. On the supply side, the government has encouraged construction of low-cost housing to serve the needs of poor people who cannot afford commodity housing. On the demand side, the central government has implemented a series of fiscal and monetary policies to discourage speculative purchases. Many of these policies, including the following, aim to restrict borrowing from banks to reduce speculation:

- The required reserve deposit ratio of People's bank of China has been increased to restrain excessive lending.
- Minimum down payments were raised from 20% to 30% for first homes with more than 90 square meters.
- For second home purchases, equity payments jumped from 40% to 50%.
- Borrowing generally is not allowed to finance third homes or purchases by external buyers.

- Special rules have been formulated to prevent developers from holding housing units for speculative purposes.
- The system of property taxation places an extra burden on people who plan to resell their houses within five years of the purchase. Households must pay the full amount of sales taxes if they resell their residential apartments within five years from the time of purchase. Individuals who resell their residential housing after five years of purchase are partially taxed if the size of the apartment exceeds140 square meters or if the price of the apartment is equal or greater than 1.2 times the average housing price.

On several occasions between 2000 and 2008, the central bank of China increased interest rates on housing loans with maturities longer than five years to discourage the demand for mortgage loans. However, the central bank eventually had to reduce the interest rate to stimulate the economy and to cope with the 2008 financial crisis.

These policies were designed to discourage excessive speculation in the real estate market that could create an unsustainable bubble and lead to a hard landing. According to Qiao (2010), property taxes on resale seem to effectively control housing prices in Tianjin, while attempts to limit loan amounts have not been as efficient. This probably is explained by the fact that people speculating in the housing market do not rely heavily on bank loans. Qiao also finds that speculation has opened a wide gap between the lower prices of housing for practical use and the much higher prices for investment purposes. The central government is trying to reduce the price divergence by increasing the supply of affordable housing and by controlling speculative activities.

Some authors have discussed problems caused by these central government policies and have indicated several difficulties involved in their implementation. First,

the interests of the central government conflict with those of provincial and local governments, because sales of parcels are major sources of revenue for many local governments. If the housing price keeps rising, fueling high speculative demand from developers, the local governments can generate more revenues. Moreover, the real estate market is highly connected with the financial and banking sectors. To decelerate the development of real estate will have a negative impact on other sectors.

The central government has not clearly defined what type of housing is low-end and affordable housing. This negatively affects the efficiency of the government policies. Additionally, developers construct buildings for financial purposes rather than social needs. It is difficult to induce developers to build low-end, economic housing since they prefer commercial housing with high expected financial returns. Finally, in reaction to the 2008 financial crisis, the central bank reduced the interest rate and created a 4 trillion RMB stimulus package for domestic development. Of that amount, 2.7 trillion RMB was applied to the real estate market. This was intended to support economic recovery, but may have aggravated the housing bubble.

Local Revenues and Housing Prices

For the purposes of this study, three sets of actors are dominant in Chinese housing markets: the government, the consumers, and the developers. Local governments are the providers of land parcels and the central government employs monetary instruments to guide individual decisions. Individuals purchase housing for practical or investment purposes. Developers purchase land from governments and supply housing to consumers.

Here, we propose that the policies of Chinese local governments have played a particularly important role in real estate markets, compared with local governments in most other countries. First, because of the socialist legacy in China, local governments have direct control over the initial sale of land parcels and public buildings. Second, unlike the situation in America and many other countries, local governments in China cannot issue their own debt, so land sales have become a major source of public finance.

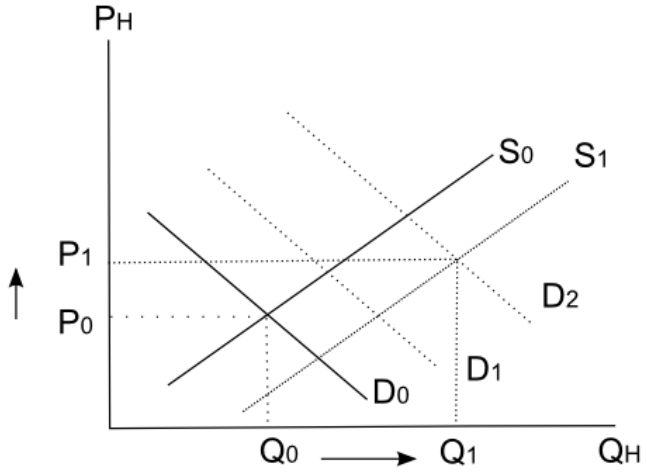

Figure 3.2. The supply and demand curve of housing market at the early stage of housing privatization

When privatization of housing began in the late 1980s, people who did not have access to low-cost housing were forced to seek property in the new housing market. They purchased housing as a basic necessity, so their demand was relatively inelastic. As the program of economic development moved forward, some individuals grew rich and demanded additional housing. As depicted in Figure 3.2, the demand for housing increased dramatically, and an increasing number of developers entered into real estate industry. However, the housing supply could not keep pace with the growing demand, so hosing prices started rising.

During these early years, the deficient supply of housing was aggravated by the fact that the Chinese central and local governments tightly controlled the land market. Housing privatization was still in its experimental phase and the land supply was regulated by central planning. The government steadily increased the land supply, but at a pace that fell short of the demand from developers. The land price and supply amount also kept increasing since the land demand overwhelmed the land supply, as depicted in Figure 3.3.

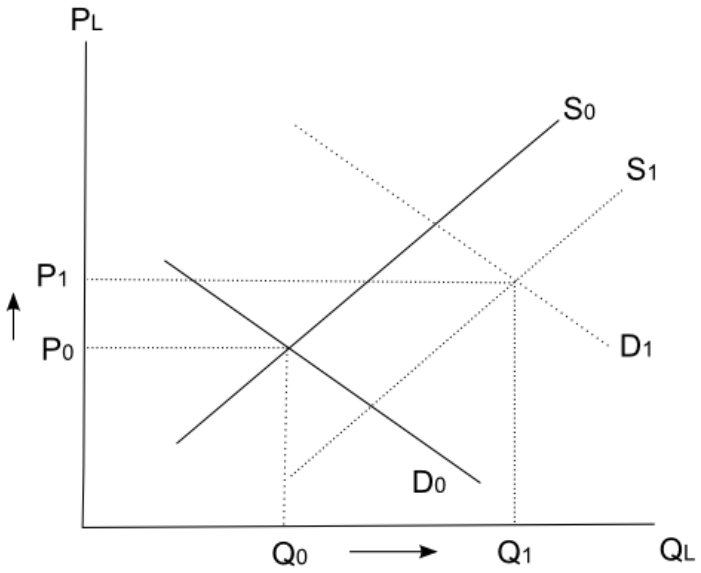

Figure 3.3. The demand and supply curve of land market at the early stage of housing privatization

As personal income and wealth increased, people with surplus savings began to search for relatively safe investments. Due to the lack of capacity and confidence in markets for financial instruments, the real estate market emerged as an attractive alternative with little apparent risk and higher returns. Because of households' high expectations of rising housing prices and traditional preference for home ownership, housing demand for both investment and practical purposes continued to increase and it

drove up the demand for land. Since consumers, developers and local governments who participated in the real estate market benefited substantially from housing investments, building construction, and land sales, an increasing number of entities were attracted into the real estate markets.

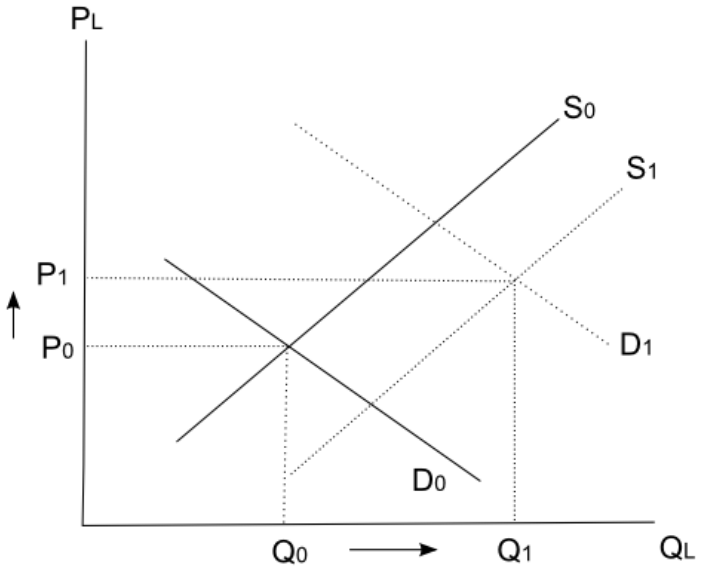

Figure 3.4. The demand and supply curve of land market in the past decade

As time passed, local governments became more dependent on land sales to generate larger government revenues. Revenues from land sales became particularly important in the inland cities, where lower rates of economic growth generated lower levels of traditional tax revenue. Although coastal areas could obtain revenues from other sources, they still took advantage of land sales. Still the public sales fell far short of satisfying developers' needs, so prices continued to rise. The big winners of the land competition are always state-owned real estate enterprises that have access to cheaper loans and can offer higher prices to buy quality sites. The moral hazard issue arises because the big state-owned enterprises believe that they will not fail due to their huge

scale. So public entities benefit on both sides of the market – from rising revenues generated by land sales on the supply side and from their preferential access to financing and the best properties on the demand side. Figure 3.4 depicts the situation in land market, both the land price and the land quantities rising.

Another complication should be noted in the housing market. As competition among developers raises the land price, some small real estate enterprises become noncompetitive because of their poor access to credit. The housing supply curve may shift to the left in the short run. In the long run, however, rising prices will draw more developers into the housing industry, shifting the supply curve again to the right.

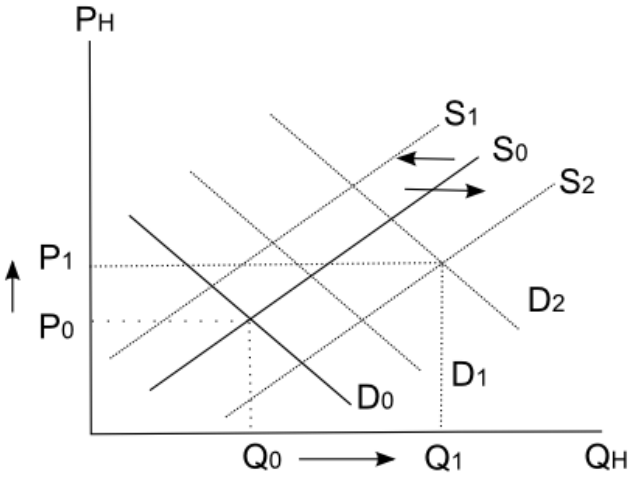

Figure 3.5. The demand and supply curve of housing market in the past decade which contains tremendous speculation

According to Zhang and An (2012), the speculative demand for investment goods is positively related with the price of goods. As the housing price keeps rising, the demand continues to grow because the majority commodity housing consumers are relatively rich, and can afford to purchase multiple properties for speculative return. Figure 3.5 describes this process. Consequently, a vicious cycle continues.

The governments sell land to finance their budgetary needs, but they are relatively unresponsive to the market demand for additional land. A substantial portion of their revenue is recycled, directly or indirectly, into real estate investments, contributing to the rising demand for land and houses. Developers benefit from the continuing increase in real estate prices, and consumers seek to benefit through their speculative purchases of real estate. In sum, the construction industry and the local governments have a symbiotic relationship that supports higher prices for land and housing.

Land is a non-renewable resource in all countries, but, because of its scarcity in relation to the population, this reality is reflected in the Chinese real estate market than in most other countries. If more land is sold today, it seems that less land will be available tomorrow. Households have expectations of growing shortages of land in the future. Hence, even when local governments increase the land available for purchase today, households and developers will expect additional scarcity of land available in the future. This growing sense of scarcity is especially strong in major cities such as Beijing and Shanghai. So people continue to purchase more housing even when prices are soaring. This speculative demand drives up housing prices even further, verifying expectations and inciting continuing purchases.

Based on this analysis, we believe there should be a positive relationship between government revenue and housing prices. In the following chapter, we will examine this relationship statistically.

Household Income and Savings

We also hypothesize that rising household incomes, which have been included as explanatory variables in many previous studies, should be a major determinant of housing

prices. Wang and Yang (2010) and Yiu (2010) are among the authors who have found that household income has a statistically significant influence on real estate prices. On the other hand, Zhang and An (2012) found that low interest rates and rapid growth of the money supply, rather than income growth, were responsible for movements of housing prices.

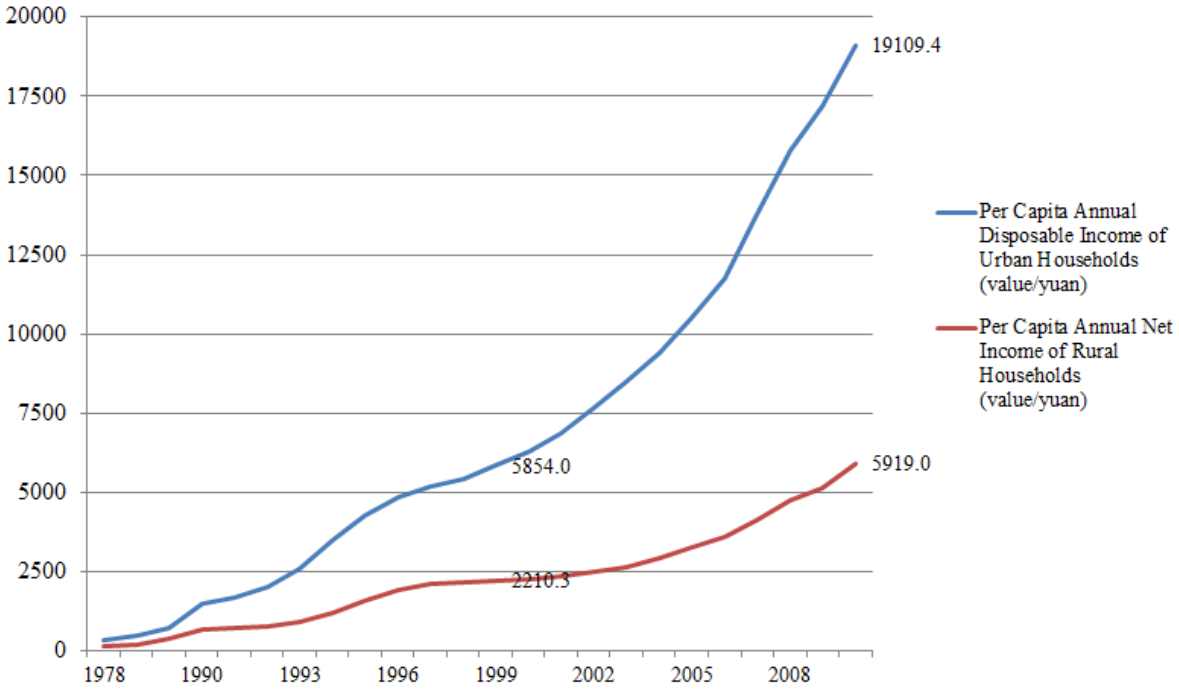

Figure 3.6. Per capita annual income (yuan). *Source:* NBSC 2011

During recent decades, individual disposable income has increased dramatically in China. Illustrated by the Figure 3.6, annual income per capita has increased dramatically for both urban and rural households. Urban household income soared from 5854.0 RMB in 1999 to 19109.4 RMB in 2010; rural household income skyrocketed from 2210.3 RMB in 1999 to 5919.0 in 2010 (NBSC, 2011). In the meanwhile, the income gaps between different cities and industries and between rural and urban areas increased considerably. Consequently, some households can afford expensive

commercial housing in big cities more easily than others. Thus, we propose that movements of average salaries may lead to housing price difference across cities, influencing housing affordability.

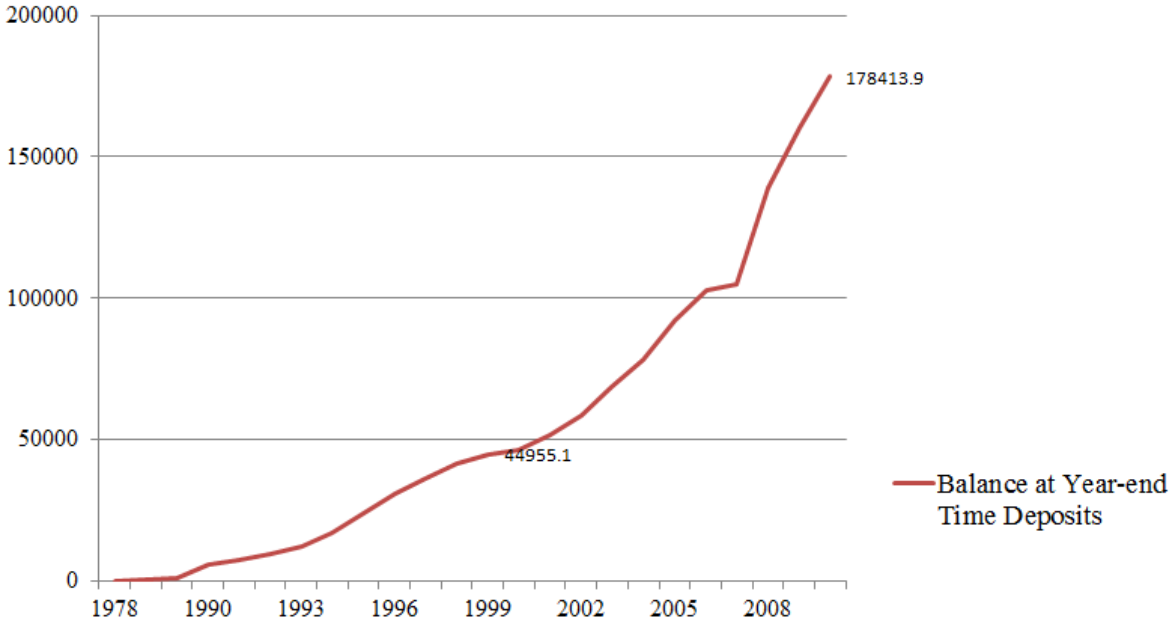

Figure 3. 7. Savings deposit of urban and rural household (100 million yuan). *Source:* NBSC, 2011

We also expect a positive relationship between the personal savings stock and housing prices, because Chinese households have a strong willingness to save for home purchases. The growth of income and improvements in the Chinese welfare system led to a high volume of savings, indirectly increasing the consumption of housing. Figure 3.7 indicates that the average stock of household time deposits stock (including both rural and urban areas at the national level) has risen exponentially between 1999 and 2010, from 44955.1 RMB to 178413.9 RMB. Hence, we predict a positive relationship between savings deposits, average salaries, and housing prices.

Population, Rural-Urban Migration and Urbanization

We also hypothesize that cities with growing migrant populations should experience rising real estate prices. During recent decades, China has experienced significant internal migration due to industrialization, marketization, urbanization and Hukou liberalization (Tunon, 2006). Domestic migration is deemed as an influential factor of housing price in cities through its influence on urban population growth (Chen and Guo, 2010).

In the Maoist period, population movements were centrally-planned and people were not allowed to independently decide their regions of residence. In order to "support the West" and to "reeducate" workers, the central government forced urban youth and intellectuals to move to distant and rural places in the west and central regions (Fan, 2005).

The economic reforms that began in the late 1970s reversed the migration pattern. The de-collectivization program resulted in higher agricultural productivity and a surge of labor surplus. In addition, the encouragement of trade and foreign investment by the government led to expansion of labor-intensive industries in urban regions. In order to further relieve the rural labor surplus pressure and to balance the demand and supply side of the labor, the central government launched a series of household registration reforms that granted peasants more freedom to work in urban areas.

Three major methods were used to transfer excessive labor forces from agriculture to other industries. The first mode was the hukou rural-urban migration. Farmers departed from rural locations and were employed in factories in urban places with their household registrations converted into urban Hukou. The second method was

called “leaving the land but not the villages” (*litubulixiang*). Farmers continued to work in their villages; but they worked in new local factories. According to the third method, farmers sometimes left their villages to find jobs in urban places without Hukou transfers. This was called “*lituyoulixiang*” or non-Hukou rural-urban migration.

In addition, the central government established five “special economic zones” (SEZs) and fourteen open coastal cities as pilot locations for economic reform. Those cities obtained policy support from the government and attracted more foreign development, creating a large demand for labors. The SEZs are highly developed, yielding excellent job opportunities with large incomes. They became the main destinations of migrants after the economic reforms.

Liu and Li (2003) provided evidence that economic development levels and income differences are the main triggers of migration. Cindy Fan (2005) also provides evidence that the economic development level and foreign investment are highly related to migration. Following the sequence of reforms, the general migration moved from inland to coastal places, from less economic-developed regions to highly economic-developed places, and from rural places to towns and then cities. Migration decisions have become more self-initiated rather than central-planned.

During recent years, China’s internal migration has grown larger and faster. Income disparities and different levels of economic development have continued to play a significant role in migration. Other factors such as social interaction, better infrastructure, and better educational opportunities and entertainment in big cities have also attracted migrants.

The specific destinations of rural migrants also have changed. Instead of mainly migrating from rural areas to towns, rural-city migration has also been increasing. Both intra-provincial and interprovincial movements are increasing. Previously rural labors mostly worked in nearby towns, but now many farmers are selecting big cities in either their home province or other provinces as destinations. This is explained by better industrial employment opportunities in the cities, by the relaxation of the Hukou system for rural migrants to work in cities, and by the large income gaps and economic development differences between coastal and inland regions.

Generally, rural farmers try to move to towns and cities; people who already live in towns also try to move to cities; households in cities try to move to capital cities in their home provinces; and people living in provincial capital cities try to move to highly developed cities, such as Beijing and Shanghai. The population flow is highly development oriented and people hope to move to places which are deemed to be superior to their current places of residence.

Tunon (2006) concluded that the main destinations of migration are four provinces -- Guangdong, Zhejiang, Jiangsu, Fujian -- and two cities -- Beijing and Shanghai. The main sources of population flows are the western and central regions. Liu and Li (2003) also found that Sichuan is the chief origin of migration and Guangdong, Shanghai and Beijing are the primary recipients.

Generally, modern migrants can be divided into two categories. One group is relatively rich and urban. They have easy access to the housing market and other privileges and they migrate for better education and human environment. Another group, mainly including migrant workers from some towns or rural places, is relatively poor and

moves for economic reasons. Moreover, the middle class, emerging in the past decades, has been a major participant in the housing market. They are relatively mobile and are more likely to own extra houses in different cities for either speculative, leisure or practical purposes, which may lead to housing appreciation in the regions of destination.

Thus, migrants may be a main source of increasing housing demand which may drive up the housing demand in destination cities.

We also hypothesize that there should be a positive relationship between population and housing prices. According to Zheng and Kahn (2010), population has a positive effect on housing price among cities. According to Wang and Zhang (2012), the urban hukou population can be highly responsible for real estate appreciation. A larger population should generate a higher housing demand which will increase housing price.

The urbanization level represents the percentage of non-agricultural population in total population. It is an indicator of the level of Hukou system relaxation in different cities. Since the Hukou system impacts access to local housing markets, the urbanization level may be positively related with housing prices.

City Effects

Cities with high levels of economic development seem to experience more rapid growth rates of housing price. The vigorous business environment in developed cities may attract large amounts both domestic and foreign investment, generating significant funding for the housing market. In addition, relatively rich migrants are more likely to move to developed cities for better business privileges and a more open environment. This may indirectly raise housing demand. What is more, economically developed cities are able to provide better employment opportunities and higher payments. This is

attractive to the middle class, who emerged in the past two decades and is an important new group of home owners and speculators. Also, local people have higher investment awareness and are more risk-taking. People in developed cities have superior access to financial resources and many of them have access to other privileges from the central government.

As we already noted, the central government established five "special economic zones" (SEZs) and fourteen open coastal cities as pilot locations for economic reform. Those cities obtained economic privileges from the government and attracted more foreign development, creating a large demand for workers. The SEZs are highly developed, yielding excellent job opportunities with large incomes. This paper predicts a positive impact of government policy privileges on city housing prices.

Investment in Real Estate and FDI Story

We hypothesize that a large increase of investment in real estate over time may cause a boom in the housing market of the specific city. According to Figure 3.1, between 1998 and 2010, the total number of housing developers nationally has more than tripled from 24378 to 85218. Also, the economic stimulus package to cope with the 2008 financial crisis has further raised investment in real estate, which may contribute to another wave of housing price inflation.

Additionally, increasing foreign direct investment is assumed to be positively related with housing price, because it is related with employment opportunities and household income.

Based on Bao and Bodvarsson (2007), there is strong evidence that destination FDI and investment in fixed assets encourage migration in China.

CHAPTER FOUR

Data

For this study, we assembled panel data for 35 major cities in China during the years, 2002 to 2010. The data are mainly sourced from China City Statistical Yearbooks for the years, 2003 to 2011. Additional data were collected from the China Statistical Yearbooks for the years, 2003 to 2011, published by National Bureau of Statistics of China.

Most of our Chinese city data are reported for entire administrative areas, covering urban and rural districts, towns, and counties that are politically managed by each city government. However, data for a few of our variables, such as pavement areas, are available only for the urban areas of the cities. We use the data for entire administrative areas when they are available, and we use data for urban districts when the broader measures are not available.

In the regression results presented below, the dependent variable is usually the average price of an apartment in a commercialized building in a particular city and year, measured in *yuan* per square meter.

In each estimated equation, our independent variables may include: total population (pop1), government revenue (government_revenue), and savings per household (savings_per), urbanization level (urban_level), foreign direct investment (fdi1), migration rate (mig_rate1), average salary of different industries per capita (ave_salary1) and investment in real estate (invest_re1), as shown in Table 4.1.

Table 4.1. Main variables

Variable	Definition	Obs
Lhp	the log form of the housing price	315
mig_rate1	migration rate in the entire administrative area	315
lsaving_per	log form of savings stock per person	315
urban_level1	the urbanization level of the entire administrative area	241
Lgr	the log form of the budget local fiscal revenue	315
lave_salary	the log form of average salary per capita	312
lfdi1	the log form of the foreign direct investment amount	312
linvest_re1	the log form of investment amount in real estate industry	315
lpop1	the log form of the total population	315
lsch_num1	the log form of the number of primary schools	315
lorg_num1	the log form of the number of industrial enterprises	315
luni_num1	the log form of the number of universities	315
lroadsize	the log form of paved roads area	313
ledu_exp	the log form of education expenditure	315
h_price	selling price of commercialized buildings	315
D. h_price	the first difference of housing price	280
invest_re1	the investment amount in real estate industry in the whole administrative area	315
ave_salary	average salary per capita	312
govern_revenue	budget local fiscal revenue	315
saving_per	average savings stock per person	315
pop1	the population in the entire administrative area	315
fdi1	the amount of foreign direct investment in the entire administrative area	313
sch_num1	the total number of primary schools	315
org_num1	the total number of industrial enterprises	315
uni_num1	the total number of universities	315
roadsize	the paved roads area at the end of one year	313
edu_exp	the local government expenditure on education	315
city_effect	the intercept obtained from the OLS using fixed effect	271
Sez	special economic zone, used as a dummy variable to indicate whether a city obtained policy privileges.	315
_211	the number of universities which are included in 985 or 211 programs	315

Savings per person is calculated by dividing total savings of all the households in each city by its total population. The urbanization level is usually defined as the ratio of the urban population to the total population. Here, based on data availability, we define it as a proportion of non-agricultural population, which is the population registered with non-agricultural Hukou. The migration rate in each city is estimated as the difference between total population growth and natural population growth.

Other useful variables that are used as instruments in our first-stage estimates of population and government revenue include the total number of universities in each city (uni_num1), the number of the elite universities (_211), the number of primary schools (sch_num1), the number of industrial organizations (org_num1), the paved road area in each city (road_size), educational expenditures (edu_exp), and a dummy variable indicating whether the city is part of a special economic zone (sez). The elite university designation is based on listings in the "985 or 211" programs. These were initiated by the central government to encourage improvement of Chinese academic ability. They are listings of the most reputable universities among students and parents.

The special economic zones (sez) include cities designated for economic experimentation and development coastal open cities. These include ten of our 35 cities: Dalian, Tianjin, Qingdao, Shanghai, Ningbo, Fuzhou, Guangzhou, Shenzhen, Xiamen and Haikou. We also treat Beijing as an SEZ because it gains many privileges from the central government. Since the SEZ dummy variable is time-invariant, we will test its relationship with the constant after ordinary least square regression to predict the city effect.

CHAPTER FIVE

Methodology and Empirical Results

Determinants of Housing Price Increases across Cities

We began our analysis by testing the influence of some factors on housing price changes in different cities during a same time base. The tested explanatory variables include population, government revenue, and savings per person, average salary, and investment in real estate, urbanization level, foreign direct investment, the migration rate, and dummy variables for each year to control for year effects.

$$\begin{aligned} Housing\ Price \\ &= \alpha + \beta_1\ Governemnt\ Revenue + \beta_2\ Saving\ per\ Capita \\ &+ \beta_3\ Migration + \beta_4\ Urban\ Level + \beta_5\ Salary + \beta_6\ Population \\ &+ \beta_7\ Real\ Estate\ Investmnet\ + \beta_8\ FDI + \boldsymbol{\mu}'\boldsymbol{X} + \epsilon \end{aligned}$$

To reduce the problem of heteroscedasticity, we used log forms of all of the variables except the urbanization level and the migration rate which are already measured in percentages.

Aside from the urbanization level and investment in real estate, all of the other variables were found to have significant relationships with housing prices, as shown in Table 5.1. They jointly explain more than 80 percent of the housing price changes. As expected, households in cities with higher average incomes and accumulations of savings tend to have higher housing prices.

Urbanization levels seem to have little influence on housing price changes. Some big cities, such as Beijing, Shanghai, and Shenzhen, have high urbanization levels and

Table 5. 1. Causes of housing price increase across cities: OLS Regression

Independent Variables	Lhp
linvest_re1	0.0299
	[0.0362]
lpop1	-0.207***
	[0.0542]
Lgr	0.250***
	[0.0488]
lsaving_per	0.169**
	[0.0746]
lave_salary	0. 0759***
	[0.0248]
urban_level1	-0.134
	[0.122]
lfdi1	0.0210**
	[0.00882]
mig_rate1	0.00358***
	[0.000976]
_Iyear_2003	-0.0832**
	[0.0409]
_Iyear_2004	-0.0735*
	[0.0435]
_Iyear_2005	0.000871
	[0.0433]
_Iyear_2006	0.0236
	[0.0451]
_Iyear_2007	0.106**
	[0.0463]
_Iyear_2008	0.0751
	[0.0548]
Constant	2.877***
	[0.465]
Observations	238
R-squared	0.864

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

high housing prices. On the other hand, some inland cities with large non-agricultural populations have relatively low housing prices and some of the coastal cities with small non-agricultural populations have more expensive housing.

Table 5.2 lists some particular cities with their urbanization levels and average housing prices in 2007. Aside from Ningbo, the other cities are capitals of their provinces. Shenyang is located in the northeastern part of China while Taiyuan, Lanzhou, Yinchuan, and Urumqi are important inland cities.

Table 5.2. Urbanization level and housing price in 2007. *Source:* NBSC, 2011

City	Year	Housing Price	Urbanization level
Shenyang	2007	3699	64.21%
Taiyuan	2007	3862	72.16%
Hangzhou	2007	7616	48.15%
Ningbo	2007	6251	34.40%
Lanzhou	2007	2967	62.18%
Yinchuan	2007	2408	63.79%
Urumqi	2007	2667	74.82%

Hangzhou and Ningbo are located in Zhejiang Province, a coastal export center, and they have low levels of urbanization but the highest housing prices. Urumqi has a non-agricultural rate of 74. 82%, more than twice of the rate of Ningbo, but its housing price (2667/Square meter) is less than half the price in Ningbo (6251yuan/ square meter). Among the seven cities, Yinchuan has the lowest housing price of 2408 RMB per square meter, but has a relatively high urbanization rate of 63. 79%. This may be explained by easing of the Hukou system, providing more people legal status to access to housing market in particular cities; however, their financial ability does not ensure them to participate in the housing market.

Migration rates also seem to be significantly related with housing prices. As economic reforms have proceeded and Hukou registration has been loosened, people have gained more freedom to move inside China. Migrants also have more access to local housing markets. Cities with various migrants introduce a larger housing demand.

$$Entire\ Population = \gamma_0 + \gamma_1\ School\ Num + \gamma_2 Organization\ Num + \gamma_3\ University\ Num + \gamma_4\ Road\ Size + \gamma_5\ Education\ Expenditure + \boldsymbol{\mu}'\boldsymbol{X} + \epsilon$$

$$Housing\ Price = \alpha + \boldsymbol{\Phi}'\boldsymbol{X} + \delta\ Population + \epsilon$$

Table 5.3. Test of instruments on city population

Independent Variables	lpop1
lsch_num1	0.404***
	[0.0399]
lorg_num1	0.118***
	[0.0310]
luni_num1	0.0920***
	[0.0296]
Lroadsize	0.319***
	[0.0506]
ledu_exp	0.0415
	[0.0375]
Constant	-1.991***
	[0.443]
Observations	236
R-squared	0.929

Note: 1. Robust standard errors in brackets, *** p<0. 01, ** p<0.05, * p<0.1. 2. Test lsch_num1 lorg_num1 luni_num1 lroadsize ledu_exp, F(5, 217) = 75.80, Prob > F =0.0000

Population size is also significantly related with housing prices, but, surprisingly, it seems to be *negatively* related. This may suggest that high housing prices have forced

many people to move out of the cities. To adjust for simultaneity, we tested the causality between population and housing price with the two-stage least squares method. Our instrument included the total number of universities in the city, the total number of primary schools and industrial enterprises, paved road areas, and educational expenditures of the local governments. In China, these factors are determined primarily by the central and local governments rather than by the market. Hence, I propose they are not affected by housing market. The variables can be treated as efficient instruments with an F value of 75.8 displayed in Table 5.3.

The results of the two-stage least square model in Table 5.4 are similar with those of the previous regression model. The population still has a significantly negative relationship with the housing price. On average, a city with larger population tends to have cheaper housing. This may be explained by the fact that "older" cities with larger populations tend to have older and cheaper stocks of housing than the smaller and "newer" cities. After the economic reforms in late 1970s, some young coastal cities were involved in market experiments. The housing markets were privatized and the cities were developed with modern buildings. For example, Shenzhen was the first pilot city of an open economy, developed with expensive, high-quality and modern buildings. Also due to its special location near Hong Kong, housing prices continue to soar.

Another possible explanation refers to the rapid urbanization and city sprawl, that some cities included towns and rural places to extend their administrative area. The rural and town places have relatively cheaper housing. Consequently, the city sprawl generated a larger population registered within the administrative area but drove down the average housing price. Wang and Zhang (2012) have found a positive relationship between

Table 5.4. 2SLS, instrument on city population

Independent Variables	Lhp
lpop1	-0.145***
	[0.0550]
mig_rate1	0.00383***
	[0.00108]
lsaving_per	0.211***
	[0.0800]
urban_level1	-0.123
	[0.127]
Lgr	0.223***
	[0.0526]
lave_salary	0.0855***
	[0.0277]
lfdi1	0.0215**
	[0.00860]
linvest_re1	0.00909
	[0.0336]
_Iyear_2003	-0.0880**
	[0.0394]
_Iyear_2004	-0.0755*
	[0.0429]
_Iyear_2005	-0.00142
	[0.0431]
_Iyear_2006	0.0249
	[0.0455]
_Iyear_2007	0.116**
	[0.0458]
_Iyear_2008	0.078
	[0.0575]
Constant	2.640***
	[0.491]
Observations	236
R-squared	0.861

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

population and housing price, different from this study. This may be explained by the fact that they used data for population with urban hukou instead of the total population.

Table 5.5. Test of instruments on government revenue

Independent Variables	Lgr
lsch_num1	-0.0117
	[0.0461]
lorg_num1	0.289***
	[0.0421]
luni_num1	0.00593
	[0.0425]
Lroadsize	0.0553
	[0.0554]
ledu_exp	0.238***
	[0.0508]
Constant	0.766
	[0.819]
Observations	236
R-squared	0.959

Note: 1. Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1. 2. Test lsch_num1 lorg_num1 luni_num1 lroadsize ledu_exp, F(5, 217) = 75.80, Prob > F =0.0000

As we hypothesized, government revenue is found to have a strong, positive, and significant relationship with housing prices. To confirm that rising government revenue is not only an effect, but also a cause of rising house prices, we ran a two stage least square regression, using the same instruments that were used in our investigation of population. In the first stage of the regression, the instruments have a strong and significant relationship with government revenues, yielding a high F-value of 29.66 revealed in Table 5.5. The second stage of the regression confirms a strong and significant influence of government revenue on housing prices shown in Table 5.6.

Table 5.6. 2SLS, instrument on government revenue

Independent Variables	Lhp
Lgr	0.376***
	[0.0556]
mig_rate1	0.00271***
	[0.000971]
lsaving_per	0.120**
	[0.0521]
urban_level1	-0.226**
	[0.110]
lpop1	-0.264***
	[0.0440]
lave_salary	0.0447*
	[0.0242]
lfdi1	0.0161*
	[0.00898]
linvest_re1	-0.0384
	[0.0409]
_Iyear_2003	-0.0741*
	[0.0412]
_Iyear_2004	-0.0566
	[0.0419]
_Iyear_2005	0.0174
	[0.0423]
_Iyear_2006	0.0434
	[0.0422]
_Iyear_2007	0.116***
	[0.0447]
_Iyear_2008	0.0742
	[0.0489]
Constant	3.350***
	[0.366]
Observations	236
R-squared	0.856

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

$$Government\ Revenue$$

$$= \gamma_0 + \gamma_1\ School\ Num + \gamma_2 Organization\ Num + \gamma_3\ University\ Num$$

$$+ \gamma_4\ Road\ Size + \gamma_5\ Education\ Expenditure + \boldsymbol{\mu}'\boldsymbol{X} + \epsilon$$

$$Housing\ Price = \alpha + \boldsymbol{\Phi}'\boldsymbol{X} + \delta Government\ Revenue + \epsilon$$

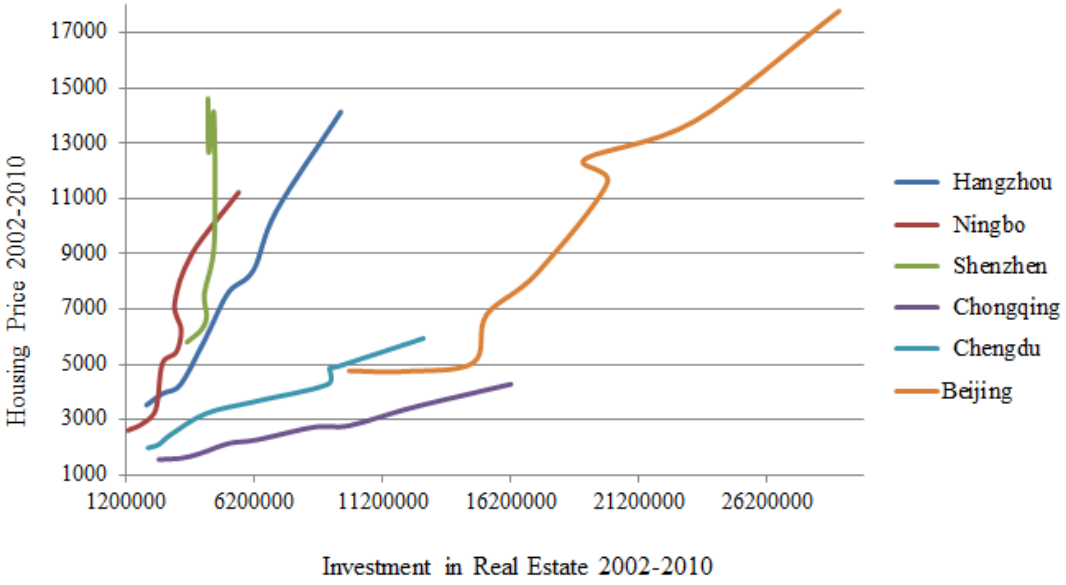

Figure 5.1. Housing price to investment in real estate 2002-2010

Surprisingly, our estimates do not indicate that investment in real estate has a significant influence on housing prices. Perhaps it is the average level of investment, rather than the total, that impacts housing prices. Displayed in Figure 5.1, some large cities, such as Chongqing and Chengdu, have large total investments, invest more, but their housing appreciation is smaller than not as fast as other cities in smaller size which invest less. Inversely, Ningbo, Shenzhen and Hangzhou have experienced rapid appreciation with relatively little total investment. In Beijing, housing prices and the investment in real estate are soaring.

Determinants of Housing Price Trends Over time

To examine the determinants of housing price trend over time, we include city fixed effects. The other explanatory variables are unchanged from our estimates across cities. Because we are not controlling for year effects, we first test for the presence of a unit root problem in our dependent variables. Since the housing prices are non-stationary shown in Table 5.7, we use first differences of all variables to estimate the regression.

Table 5.7. Unit root test of housing price

	Statistic	p-value
Unadjusted t	5.2072	
Adjusted t*	8.4866	1.0000

We find that the unadjusted housing price definitely has unit root problem. When we test the first differences of housing prices and other variables, the problem is resolved. Hence, our subsequent regressions will be estimated on first differences of all variables with fixed city effects.

Under these circumstances shown in the first column Table 5.8, we find that government revenue and investments in real estate have positive and significant influences on house prices. Savings per person is significant but with negative effect. The urbanization level is still insignificant. Unlike our results for estimates across cities, average salaries, total population, and migration rates are found to be statistically insignificant determinants. The overall explanatory power of the model is less than 20%.

Since our study is based on the most recent data, covering the period between 2002 and 2010 when urbanization had already reached a high level for many cities, it is not surprising that the urbanization level has little significance.

Since we have found the urbanization level to be insignificant in both sets of regressions, OLS estimates with that variable excluded are used as a baseline in our following analysis displayed in the second column in Table 5.8. We also employ two-stage least square to further examine the direction of relationship between the government revenue and housing prices.

Table 5.8. OLS test with and without urbanization level

D.h_price	1	2
D.invest_re1	0.000165**	0.000159**
	[7.67e-05]	[7.35e-05]
D.govern_revenue	0.000313***	0.000329**
	[0.000106]	[0.000127]
D.ave_salary1	0.00644	0.0186
	[0.0227]	[0.0275]
D.saving_per	-0.0847***	0.00744***
	[0.00919]	[0.00170]
D.pop1	-0.549	-2.155
	[2.006]	[2.119]
D.mig_rate1	-3.847	1.539
	[3.178]	[4.014]
D.fdi1	-3.84E-06	2.95E-05
	[3.83e-05]	[5.38e-05]
D.urban_level1	412.8	
	[543.2]	
Constant	499.2***	193.7**
	[88.96]	[96.37]
Observations	203	271
Number of city_num	35	35
R-squared	0.441	0.258

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

After removing the urbanization variable, average salaries, the total population, migration, and foreign direct investment all continue to be insignificant in determining

housing price trends. Savings per person, government revenue, and investment in real estate are statistically significant and positively related with housing price movements. They jointly explain 34% of the overall change of housing prices.

The surprising insignificance of the migration rate may result from the fact that relatively few migrants can now afford to purchase urban housing. Migrants can now be divided into two groups: rural-urban migrants and urban movers. Most rural-urban migrants have low educational levels and move for economic reasons. This group occupies a large portion of total migrants, but evidently has little influence on the housing market because of their low levels of income and wealth. Most of the housing available in the market is commercial, high quality, and expensive. Urban movers are relatively rich and well-educated. Most of them migrate from less-developed to more-developed cities for business extension, better infrastructure, better entertainment, and other privileges. Urban movers represent a small portion of the floating population, but they play a major role in housing consumption and investment.

Hence, the migration rate used in this study seems to be statistically insignificant when we control for city fixed effects because it does not distinguish between these two groups of migrants. In the previous section, when we controlled for year effects, we found a more significant relationship. Perhaps the cities with larger migrant populations are also able to attract more rich people who can employ the rural-urban migrants and afford commercial housing due to a larger base. For a specific city over the years, even there is rising migration, the wealth gap seems to separate the majority of the floating population from the real estate market. Furthermore, some local governments have adopted policies to restrict housing access from external movers when housing markets

overheat. For example, without a Beijing Hukou, it is currently difficult to purchase housing in Beijing market.

Table 5.9. 2SLS,instrument on government revenue

Independent Variables	D.h_price
D.govern_revenue	0.000631***
	[0.000212]
D.pop1	-2.446
	[2.152]
D.ave_salary1	0.00281
	[0.0300]
D.saving_per	0.00612***
	[0.00185]
D.mig_rate1	0.853
	[4.147]
D.invest_re1	0.000141*
	[7.52e-05]
D.fdi1	2.98E-05
	[5.45e-05]
Constant	132.7
	[103.1]
Observations	267
Number of city_num	35

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

We find that average salaries play a less important role in the housing market than savings per household. Evidently, self-funding rather than bank loans are the main funding source for Chinese households in the housing market. This is intuitively reasonable. The mortgage lending market is limited and Chinese people seem to prefer saving over borrowing for housing purchases. Many people buy apartments for investment and speculative purposes until their savings are nearly exhausted. The main

purchasers of housing were born in late 1940s to 1960s. They buy apartments for themselves or for their children.

We find that government revenue has a strong impact on housing prices over time. To further test the causality between the housing price and government revenue, we estimated the model with two stage least squares, using the same instruments that were employed in our previous estimates. With this additional control, we still find that government revenues play a significant role in inflating housing prices over time, illustrated in Table 5.9.

Table 5.10. Test of city effect

Independent Variables	D.h_price
D.govern_revenue	0.000631***
	[0.000212]
D.pop1	-2.446
	[2.152]
D.ave_salary1	0.00281
	[0.0300]
D.saving_per	0.00612***
	[0.00185]
D.mig_rate1	0.853
	[4.147]
D.invest_re1	0.000141*
	[7.52e-05]
D.fdi1	2.98E-05
	[5.45e-05]
Constant	132.7
	[103.1]
Observations	267
Number of city_num	35

Note: Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1

We also have examined the factors that generate different housing price trends in different cities over time. We regress the constant terms from the city fixed effects model on time invariant city characteristics, including the number of popular universities and Special Economic Zone (SEZ) status. The sez variable indicates whether a city is granted special economic privileges by the government.

Our estimates suggest that SEZ status does, in fact, have significant positive influence on housing prices, but, perhaps surprisingly, the presence of high-ranking universities seems to have a negative relationship, described in Table 5.10. This may be explained by the fact that many of the cities that have achieved high levels of economic development are relatively young, and have fewer famous universities. Many of the older cities with famous universities have little land available for economic development, and thus have lower average housing prices.

CHAPTER SIX

Other Important Variables and Future Research Plan

A full assessment of the determinants of real estate prices in China will require additional research that extends beyond the scope of this study. Our results must be considered exploratory and preliminary, because the data that are needed for a more careful analysis are still not available to us.

Land Price

Land prices are responsible for a significant part of housing cost and rising land prices are widely recognized as a major cause of housing bubbles in China. However, we did not have access to land price data at the city level, it is not included in the model. According to Zhang and An (2012), land price growth is closely related to housing price changes. The Figure 6.1indicates that the value of land purchased soared from 144.5 billion RMB in 2002 to almost 600 billion RMB in 2008. The growth of land purchases paused from 2008 to 2009 due to the financial crisis, but purchases rose again to 1000 billion RMB in 2010 in response to the economic stimulus plan.

Zhao and Zhang (2012) also argue that the land price boom in China is a result of the significant dependence of local governments on funding from land sales. They have no strong incentive to prevent a housing price surge. In addition, although the Chinese stock market is relatively underdeveloped, it helped to mobilize a huge volume of funds for developers to bid for parcels and construction of buildings. Capital accumulation through the stock market certainly affected the real estate market. Although government

revenues in this paper reflect developments in the land market to some extent, it will be important to directly examine the influence of regional land prices in future research.

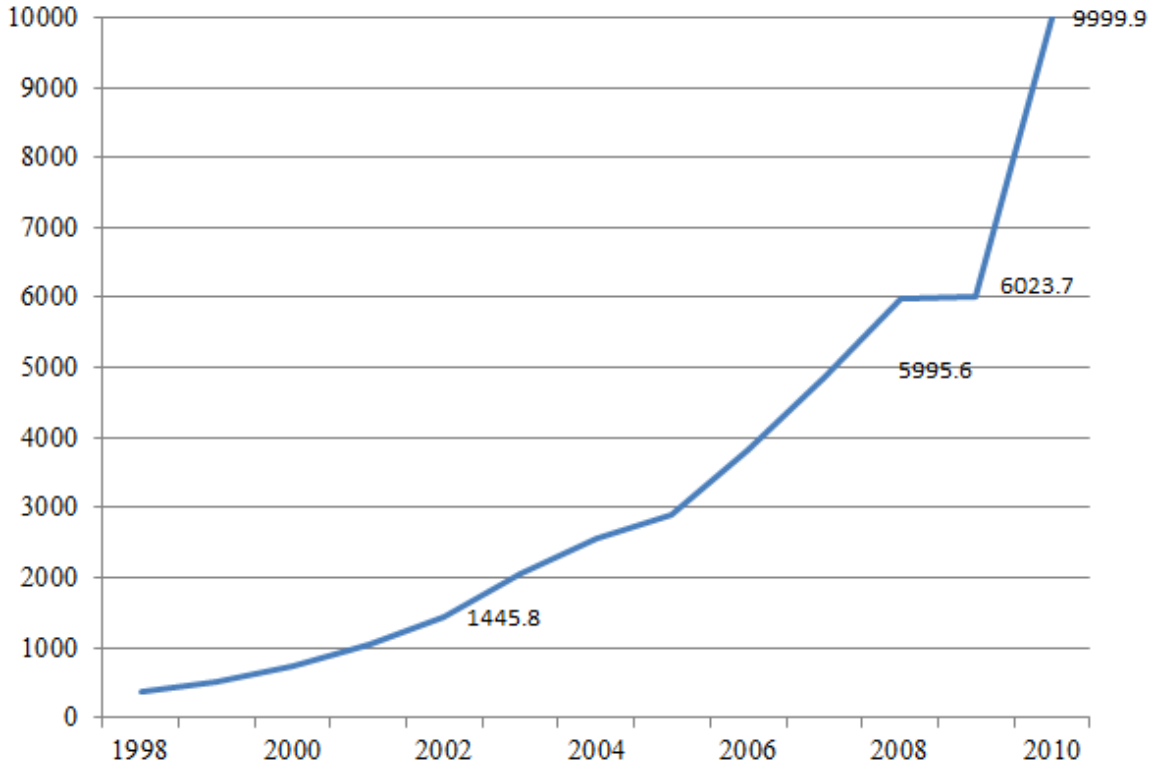

Figure 6.1. Total Value of Land Purchased (100 million yuan)

The Figure 6.2 depicts the land price trend from 1998 to 2010, calculated by dividing the total value of land purchase by the total land space purchased at the national level (data from the Chinese National Bureau of Statistics). The land price per square meter tripled from 461 RMB in 2002 to 1524 RMB in 2008. Although the growth of land purchases slowed in 2008 due to the global financial crisis, the actual land transaction value did not fall and land prices kept increasing. By the end of 2010, the average land price jumped to 2503 RMB per square meter.

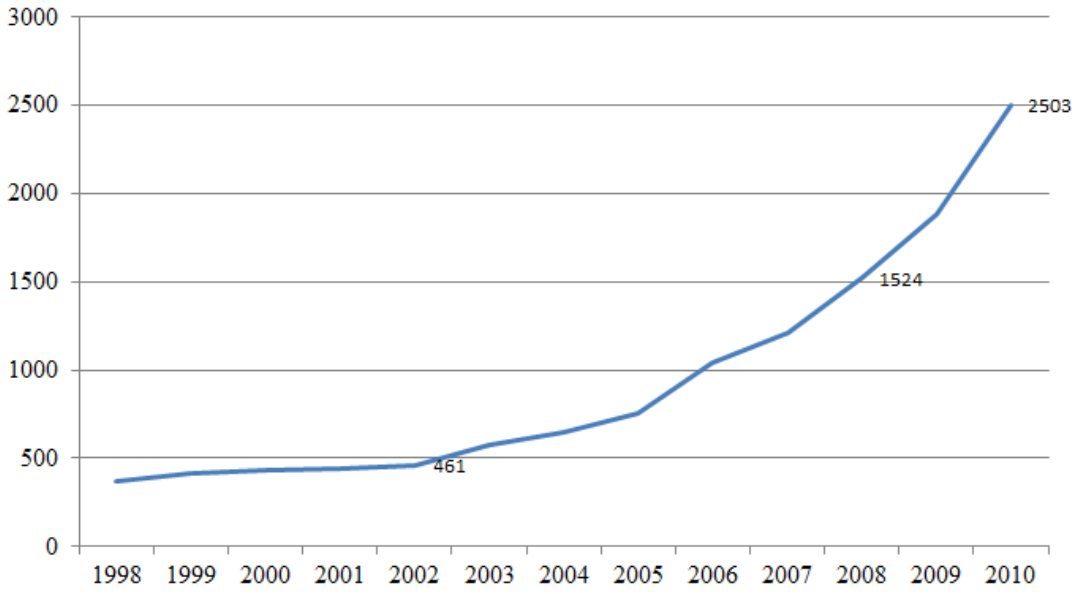

Figure 6.2. Land price (yuan/sq.m)

Financial Institutions

According to Zhang and An (2012), monetary growth has a major effect on the housing market and mortgage lending is substantially guided by monetary instruments of the central government. However, it is difficult to assess these monetary influences at the local level. Due to disparities in economic openness, it is difficult to even count the numbers of financial institutions across cities. In Zhejiang province, there are many financial institutions, including international banks, city banks, and even many township banks and county banks. Many underground banking and illegal finance sources (private finance) are also present. Compared with inland cities, the Zhejiang financial system is more developed and diverse. The finance market in inland cities is less flexible with limited numbers of banks. Only famous financial institutions may have branches there but with fewer offices than in coastal regions. Also, the same bank may provide different kinds of services in coastal cities and inland cities. It is difficult to compare the levels of

financial development in different cities, but these undoubtedly perform an important role. It will be essential to find effective indicators of financial capacity in future research.

Monetary Policy

In most countries, monetary policy plays an important role in the housing market. In the Chinese case, this is accomplished through many monetary tools, including the interest rate, money supply growth, mortgage requirements, and the exchange rate scheme.

The interest rate in China is highly regulated by the central government rather than determined by the market. As illustrated by Figure 6.3, since the 1990s the government has dramatically changed the interest rates on loans longer than five years. The interest rate was reduced from a peak of 15.12% in 1996 to 5.76% in 2004, causing the real estate market to surge. This worked together with other economic reforms to provide households incentives to conduct economic activities. However, in an emerging market economy, it is quite possible to develop real estate bubbles since their market and government departments do not prepare sufficient financial instruments for their residents to store value. The Chinese central government then raised interest rates to prevent the property market from overheating. The continuing growth of interest rates paused at the end of 2008, when the financial crisis negatively affected the global economy. In December 2008, the interest rate declined to 5.94%. Later, due to the economic recovery, the central government raised the interest rate gradually again.

The loan interest rate is remarkably high compared with savings' interest rate, providing higher profits for banks to grant loans. Along with centrally-planned interest rates, reductions of mortgage down payment requirements are also responsible for

increasing the demand for real estate (Hua and Zhang 2012). The banks have strong incentives to loan to individuals and the decreasing interest rate stimulates individuals to finance their housing, increasing the housing demand. However, many scholars think that bank loans are not the main funding source for households to buy houses, because households have such a high savings rate. According to Yang (2009), many Chinese households have idle capital for housing purchases and instruments such as interest rates and down payment requirements do not have a major influence on housing demand.

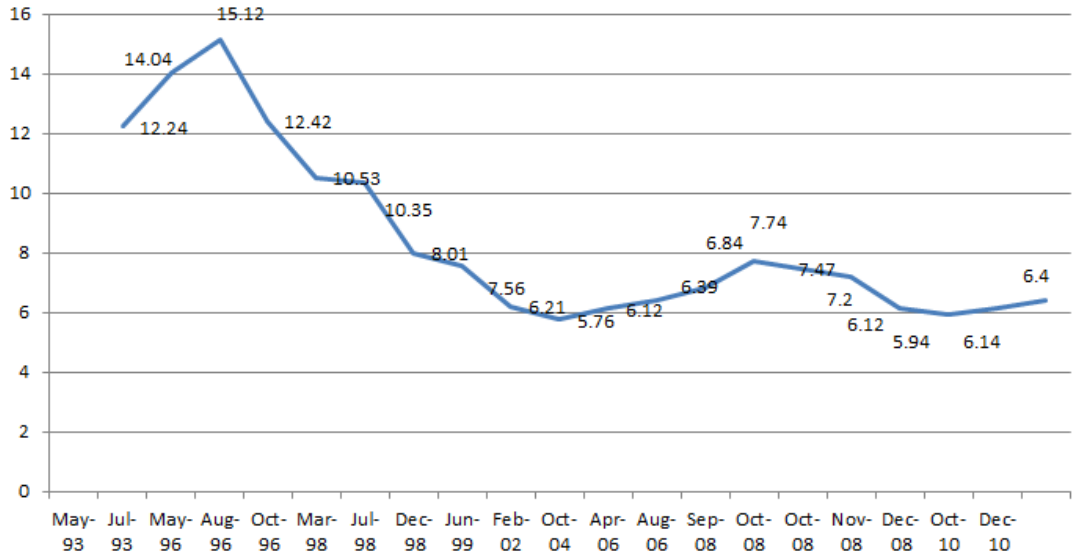

Figure 6.3. Interest Rates of Major Loans Annual Interest Rate %

Some authors believe that the exchange rate system is also highly responsible for soaring housing prices. The Chinese central government maintains a fixed exchange rate system, pegging its currency to the US dollar, setting a low value of the RMB. According to Whalley (2006), the prices of goods and services are relatively low compared with many countries. From this perspective, the Chinese yuan is undervalued, attracting foreign direct investment and to accelerating the export sectors. Along with the

FDI increase, a huge amount of hot money has entered into the Chinese market, fueling the real estate market. Foreign investors also have incentives to inject money into Chinese real estate market because they expect the RMB to appreciate. Additionally, undervaluation of the RMB may impact housing prices by increasing domestic currency liquidity and money supply. The relatively cheap RMB generated a significant export surplus and the central government has accumulated enormous international reserves.

Together with domestic credit, the money supply and currency liquidity have been raised enormously. The situation grew even more extremely after 2008 when a huge stimulus package to support recovery of the economy was employed by the central government. The real estate market attracted a large share of the growing supply of money. Zhang and An (2012) discovered a positive and unilateral causal relationship from monetary growth to housing prices.

More importantly, since the Chinese central government has controlled the financial market strictly and the Chinese capital market is underdeveloped, households have a limited number of investment alternatives. The capital market is more volatile and less profitable than real asset investment. In addition, loose monetary policy caused investors to fear inflation, providing further encouragement to hold wealth in the real estate market. An and Zhang (2012) find that house price inflation positively responds to the CPI inflation shock.

Government Policy to Prevent Housing Market from Overheating

The central government has introduced a series of policies to control the housing price since 2005 and some local governments also have their own programs to restrain housing price growth. Yang (2009) has provided some evidence to prove the

effectiveness of the government policy in controlling housing prices. However, the different rules are often announced together at the national level but implemented differently in each city. Thus, it is difficult to include these factors in the analysis, but the housing market is highly responsive to government policies, and it will be important to them into take fuller account in future tests.

Housing Supply and Market Structure

Some researchers have suggested that insufficient housing supply due to excessive development of commercial construction has caused residential housing price inflation. The Chinese government has encouraged the construction of commercial buildings to support rapid economic growth and, consequently, the developers have little incentive to provide economic and low-end housing (Zhang and Zhao, 2012). The inequality and inefficiency in the housing supply has contributed to high housing prices. Future work should focus on the low-end and high-end housing markets separately.

Furthermore, the particular Chinese market structure may be responsible for the expensive housing. In the Chinese real estate market, large state-owned enterprises are the chief players. They have access to subsidized loans from banks and provide high-priced properties in the housing market. SOE developers are more likely to obtain high-quality parcels with relatively cheap prices. A moral hazard problem arises between those big entities and the central government. Those large SOEs believe that they are too influential to fail and the government will socialize the risks for them. Hence, they are far less risk-averse than other developers in the housing market. Deng and Gyourko (2010) also find that if a central state-owned enterprise wins a land auction, the

transaction price tend to be much higher. To better understand the effect of land market on housing market, it will be helpful to conduct in-depth research on the SOE developers.

Marriage and Housing Demand

Finally, some studies have attempted to test for the influence of marriage on housing prices. In China, housing is not only a practical or investment good but also a status good. The ownership of housing is a signal of wealth. Chinese women wish to marry high-status men, and owning rather than renting housing is one of the most essential criteria. Wei and Zhang (2012) suggest that housing sizes and prices seem to be positively associated with local sex ratios (the number of men to woman in the pre-marital group). Among families with at least one adult son, they find that more housing wealth will increase the marriage likelihood of an adult son. Hence, families with sons may make a special effort to own housing, attempting to increase their sons' competitiveness in the "marriage market." This may increase housing demand and drive up housing prices in regions with a higher sex ratio. Girls' families also sometimes purchase houses to raise their daughters' bargaining power in future families. With a higher level of housing wealth, girls can marry to a wealthier man since some boys will also consider the relative wealth level of girls' families. Consequently, the marriage pressures increase the housing competition, resulting in housing price increases. However, Zhang and Zhao (2012) found an opposite result. They provide direct evidence that it is monetary policy rather than marriage ideology that drives up housing prices.

Speculative Purchases

In China, individuals have high expectations of a rising housing market. Speculative purchases seem to be a primary cause of the overheating housing market, but this is difficult to measure with precision. In previous studies, three items can be treated as speculation proxies: the vacancy rates of commercial housing, real estate price in previous periods, and ownership of multiple homes.

In China, many people purchase apartments without living in them or leasing them to others, so there is a very high vacancy rate in the major cities. Rich households own many houses but often to not finish their interior decoration or offer them for rent (Huang and Yi, 2010). In some cases, households may move to a new apartment and rent out their initial house that is already decorated. The vacancy rates of apartments may reflect the level of speculation, but it is difficult to gather these data.

Second home ownership, is a common phenomenon in China, because the lack of a property tax reduces the cost of holding extra homes. People invest in not only the local housing market but also other urban housing markets. For example, many people in the Northeast may purchase housing in Sanya for leisure and recreation. Also, people working in Hong Kong may purchase housing in Shenzhen. Moreover, some parents purchase a second home for their children to access reputable schools or to obtain educational privileges. Second home ownership seems a powerful indicator of speculative purchases, but there is no precise information of the quantity of apartments each household owns. According to Huang and Yi (2010), approximately 15 percent of urban households owned two or more homes in 2007.

Some of the younger cities, such as Sanya and Wenzhou, are experiencing particularly high rates of housing inflation. Future tests should focus on the motivations for urban movers to buy houses in particular cities, perhaps drawing on surveys of rich migrants in the housing market. The quality of the housing, such as air conditioning, beach access, and climate may also be considered.

CHAPTER SEVEN

Conclusion

In conclusion, this paper aims to examine which factors lead to housing price increases in Chinese major cities, using panel data for 35 large and medium-sized cities from 2002 to 2010. We examine some variables that prior studies have not considered as carefully, such as government revenue, migration rates, and urbanization levels.

Our empirical analysis attempts to identify the determinants of housing price differences across cities and across time. The income and savings disparity, FDI amount and migration rate can cause housing price difference among various cities in particular years. Somewhat surprisingly, government revenue has a significantly positive correlation with housing prices and the population is negatively related with property prices in different cities. Differences in urbanization levels and investments in real estate seem to have little significance in housing price differences between regions. We also explore the factors leading to growth in housing prices over time in specific cities. After initial tests, we excluded the urbanization level from our analysis because most cities already reached high urbanization levels before the research period. Over time, the population, the FDI amount, and migration seemed to be uncorrelated with housing prices, but increases in real estate investment were significant determinants over time. The average stock of savings rather than the average salary level had a positive effect on housing prices. Evidently, Chinese households finance housing purchases from personal savings rather than borrowing. Moreover, according to instrumental variables estimates, government revenue is both a cause and a result of rising house prices.

These outcomes reveal some specific traits of China. First, the central government has intervened in the market heavily in the past and local governments are now major players in the housing market. The central and local governments have conflicting interests, so it is difficult for the central government to curb overheating of the housing market. Tremendous profitability in the property sector incites local governments, developers and consumers to participate actively in speculative activities, contributing to a vicious cycle of property price inflation. Furthermore, the main purchasers of urban housing are relatively rich people buy housing not only for practical purposes but also for speculation. Many apartments have been purchased and set aside, making them unavailable on the market. While there is a high vacancy rate of high-end housing in many major cities, the supply of economic and low-end housing is inadequate, laying a heavy burden on rural migrants. This contributes to the growing gap between the rich and the poor. Moreover, the lack of investment vehicles is a major reason for households to pour idle money into the real estate market.

Much can be added to this story in future research. For example, second home ownership can be treated as a proxy of speculative activities. Future work can examine more carefully the differences between the rural and urban segments of the migrant population and the markets for high-end and low-end housing. Finally, the central government has introduced a series of policies to reduce housing price inflation. Future work should assess the effectiveness of these measures.

REFERENCES

Ahuja, A. , Cheung, Han, L. , G. , Porter, N. and Zhang, W. (2010) *Are Housing Prices Rising Too Fast in China?* IMF working paper

Bao, S. , Bodvarsson, O. , Hou, J. and Zhao, Y. (2007) Interprovincial Migration in China: The Effects of Investment and Migrant Networks. IZA Discussion Paper No. 2924.
<http://ssrn. com/abstract=1001411>(accessed August 6, 2012)

Chen, F. , Mehrotra, A. and Funke, M. (2011) *What Drives Urban Consumption in Mainland China? The Role of Property Price Dynamics.*

Chen, J. , Guo, F. and Wu, Y. (2011) *One decade of urban housing reform in China: Urban housing price dynamics and the role of migration and urbanization, 1995–2005.* Habitat International, Vol. 35, pg 1-8.

Chen, J. , Hao, Q. and Stephens, M. (2009) *Assessing Housing Affordability in Post-reform China: A Case Study of Shanghai*. Housing Studies, Vol. 25, No. 6, 877-901.

Chen, L. (2011) *Evaluation of the Existence of a Housing Bubble in China.* University of California, San Diego.
<http://empac. ucsd. edu/assets/001/502297. pdf> (accessed August 6, 2012)

Chen, R. (2010) *Divided World: China's Land Tenure System and Implication to Foreign Investment in China.* Dong-A Journal of IBT Law, Vol. 1:2.

Chow, G. and Niu, L. (2009) *Demand and Supply for Residential Housing in Urban China.*

Deng, L., Shen, Q. & Wang, L. (2009). *Housing Policy and Finance in China: A Literature Review* (Prepared for U.S. Department of Housing and Urban Development).

Deng, Y. , Gyourko, J. and Wu, J. (2010) *Evaluating Conditions in Major Chinese Housing Markets.* NBER Working Papers 16189, National Bureau of Economic Research, Inc.

Duda, M. , Zhang, X. and Dong, M. (2005*) China's home ownership oriented housing policy: an examination of two programs using survey data from Beijing*. Issue 7 of Joint Center for Housing Studies working paper series, Joint Center for Housing Studies, Graduate School of Design [and] John F. Kennedy School of Government, Harvard University.

Fan, C. (2005) *Economic Opportunities and Internal Migration: A Case Study of Guangdong Province, China*. University of California, Los Angeles.

He, S. and Wu, F. (2010) *Poverty Concentration and Determinants in China's Urban Low-income Neighborhoods and Social Groups.* International Journal of Urban and Regional Research, Vol. 34. 2 pg 328-349.

Huang, C. (2012). China's *Economic slowdown felt by its young generation.* < http://www.pbs.org/newshour/rundown/2012/10/chinas-economy-affects-youth.html > (accessed August 6, 2012)

Huang, Y. and Clark, W. (2001) *Housing Tenure Choice in Transitional Urban China: A Multilevel Analysis.* Journal of Urban Studies, Vol. 39, No. 1, pg 7-32.

Huang, Y. and Jiang, L. (2009) *Housing Inequality in Transitional Beijing.* International Journal of Urban and Regional Research, Vol. 33. 4, pg 936-956.

Huang, Y. and Yi, C. (2010) *Second Home Ownership in Transitional Urban China.* Journal of Housing Studies, Vol. 26 No. 3, pg 423-447.

Jin, Z. (2011). *Housing Wealth and Consumption in the Chinese Urban Economy: Evidence from Micro-data.* University of California, Berkeley.

Kosareva, N. and Struyk, R. (1993) *Housing privatization in the Russian Federation*, Housing Policy Debate, 4, pp. 81–100.

Lee, J. (2000). *From Welfare Housing to Home Ownership*: The Dilemma of China's Housing Reform. Housing Studies, Vol. 15, No. 1, 61 – 76, 2000.

Li, Y. (2011). *The Impacts of China Housing Reform on Residents' Living Conditions.*

Liao, A. (2011) *Urban Land Tenure in the People's Republic of China.* Master's Thesis in Brandies University.

Liu, S., Li, X. and Zhang, M. (2003). *Scenario Analysis on Urbanization and Rural-urban Migration in China.* Institute of Geographic Sciences and Natural resources Research Chinese Academy of Sciences, Beijing.

Logan, J. , Fang, Y. and Zhang, Z. (2009) *The Winners in China's Urban Housing Reform*. Journal of Housing Studies, Vol. 25, No. 1, pg 101-117.

Nature. (2012) *Land Tenure.* <http://www.nature.org/media/china/chinabook-part2-highres.pdf≥ (accessed August 6, 2012)

Qiao, X. (2010) *A review of the Chinese Real Estate Market.* University of Pennsylvania, working paper.

Tian, L. (2008) *The Chengzhongcun Land Market in China: Boon or Bane?-A perspective on Property Rights.* International Journal of Urban and Regional Research, Vol 32. 2, pg 282-304.

Tian, T. (2007) *Determinants of Chinese Housing Market.* Royal Institute of Technology, Stockholm , Sweden.

Tuñón, M. (2006). *Internal Labour Migration in China: Features and Responses.* ILO office, Beijing, China.

Wang, S. , Yang, Z. and Liu, H. (2010) *Impact of urban economic openness on real estate prices: Evidence from thirty-five cities in China*. Journal of China Economic Review, Vol. 22 Issue 1, p42.

Wang, Y. (2004). Urban Poverty, Housing and Social Change in China. Routledge.

Wei, S. and Zhang, X. (2009) *The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China*. NBER Working Papers 15093, National Bureau of Economic Research, Inc.

Whalley, J. (2006). *China in the World Trading System.* CESifo Economic Studies, Vol. 52, 2/2006, 215–245.

Wu, W. and Rosenbaum, E. (2008) *Migration and Housing: Comparing China with the United States.* Urban China in Transition, Blackwell Publishing Ltd.

Wu, X. (2011). *The Household Registration System and Rural-Urban Educational Inequality in Contemporary China.* Population Studies Center Research Report 11-735.

Yang, Q. (2009) *An empirical Analysis of the Chinese Housing Market.* Centre College.

Yang, Z. & Shen, Y. (2008). The affordability of owner occupied housing in Beijing. *J Hous and the Built Environ (2008) 23:317–335*.

Yiu, C. (2010) *The changing nature of household demand and housing market trends in China.* RICS Symposium, Edinburgh, UK, September 8-10, 2010. <http://ssrn. com/abstract=1669166 or http://dx. doi. org/10. 2139/ssrn. 1669166>

Yu, H. (2011) *Size and Characteristics of Housing Bubbles in China's Major Cities: 1990-2010.* China and World Economy, Vol. 19, No. 6.

Zhang, C. , An, G. and Yu, X. (2012) *What drives China's housing prices: Marriage or Money?* China and World Economy, Vol. 20, No. 4.

Zhang, Q. and Wang, Z. (2012). *Fundamentals in China's Housing Markets*.

Zhang, Y. , Hua, X. and Zhao, L. (2012) *Exploring determinants of housing prices: A case study of Chinese experience in 1999–2010.* Journal of Economic Modelling, Vol. 29, Issue 6, pg 2349-2361.

Zheng, S. , Kahn, M. and Liu, H. (2009) *Towards a system of open cities in China: Home prices, FDI flows and air quality in 35 major cities*. Journal of Regional Science and Urban Economics, Vol. 40(1), pg 1-10.

Data Sources

National Bureau of Statistics of China (NBSC). China Statistical Yearbook, 2002 to 2011,

———. China City Yearbook, 2002 to 2011