LUND UNIVERSITY

School of Economics and Management



# China's Urban Housing Market

*Driving Factors and Systemic Risk*

By

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**Abstract**

The rapid rise in urban home prices in China's major metropolitan markets raises concern of an asset bubble. This paper performs a multivariate panel data regression on home prices of 35 major Chinese cities to identify driving forces and systemic risk factors. A combination of independent variables shown in the literature to explain urban home prices is examined and defined as being either fundamental or non-fundamental. The fundamental variables are real wage growth, urban population growth, and amenity improvement, all of which indicate healthy signs for the housing market and economy. Non-fundamental variables include local government deficits and property developer inventory buildup, which indicate signs of a rigid housing supply system that may be causing a bubble in home prices. To further understand the systemic risk the housing market faces, a discussion of China's shadow banking sector, high credit levels, and a comparative analysis of Japan's real estate market crash are explored. Policy implications of ways to mitigate risk are provided throughout the paper. Results from the regression show that real wages and pollution reduction are significantly correlated with rising home prices, whereas, local government deficits and inventory buildup are not. Further analysis of systemic risk determines that a real estate market collapse in China of a magnitude similar to that of Japan's in the early 1990s is unlikely due to a financial system supported by low central government debt and the absorptive productive capacity of inland provinces.

**Keywords**: housing market, China, systemic risk, real estate, bubble

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# Introduction

China's economy has experienced extraordinary growth over the last several decades. Since China's economic reform in 1978, the country experienced the fastest sustained economic expansion of any major country and has alleviated poverty for 800 million people (World Bank 2018a). Its economy has grown from the 11th to second largest in the world since reform began, with an average annual real GDP growth rate of 9.6 percent (World Bank 2018b). Along with productivity growth came mass urbanization as Chinese citizens moved to cities for higher wages, thus raising demand for urban housing. On a national level home price appreciation has trailed GDP growth, however in large urban markets, such as Shanghai and Shenzhen, home prices have increased rapidly in recent years, raising concern of an unsustainable growth trend (Figure 1).

In order for China to develop into an advanced economy it is important to promote household wealth accumulation. Rising home prices can cause wealth inequality between homeowners and those priced out of the market, hindering the growth of the middle-class. Households also tend to over-save in order to afford homes at inflated prices, thereby lowering household consumption patterns. Furthermore, home prices in major Chinese cities have spiked in recent years which could be reciprocated by volatility to the downside. In just two years, between 2014 to 2016, home prices in both Beijing and Shanghai rose in aggregate over 55 percent. In Shenzhen, prices rose almost 90 percent (NBSC 2018). If home prices contract, construction could halt leading to a credit crunch and economic recession.

Understanding the factors that influence Chinese home prices can provide insight into ways the government can manage the housing market and prevent a collapse. This paper reviews the literature on urban housing markets and combines variables from several studies in a multivariate panel data regression on average home prices of 35 major Chinese cities. The goal is to identify which factors capture the most variation in home prices. Three variables are determined to be healthy factors contributing to growth and prosperity. Two variables are determined to increase the risk of a housing market collapse. They are defined by the author as fundamental and non-fundamental variables. For a comprehensive review of the risks facing China's housing market, additional analysis is provided on factors not tested including construction costs and vacancy rates. The review is followed by a discussion on major systemic risk issues.

The paper is structured as follows: section 1 provides an overview of China's housing market development and its contribution to economic growth. Section 2 is a literature review that discusses and analyzes the fundamental and non-fundamental variables

shown to explain home prices. Section 3 tests these variables in a panel regression, determining which variables best explain the rise in home prices across the 35 city sample. Section 4 begins to delve deeper into understanding the risk of a housing market collapse by examining other variables not tested including construction costs and vacancy rates. Section 5 provides a discussion of major systemic risk factors facing the Chinese housing market and economy. Section 6 provides an evaluation of the potential of a housing market collapse. Lastly, the conclusion offers an opinion on the state of China's housing market.
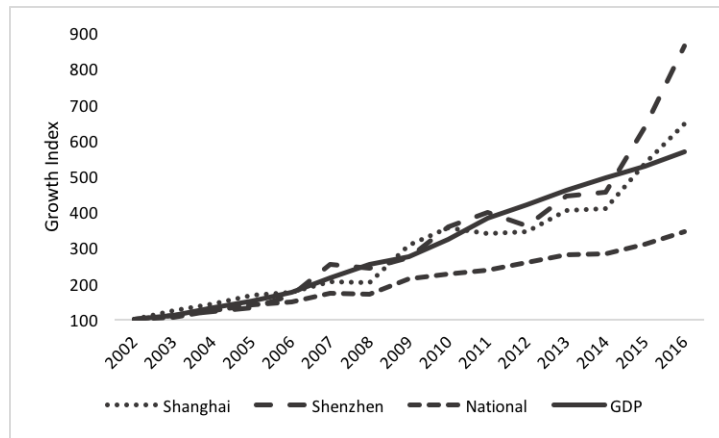


Figure 1: Home Price Appreciation

Average annual growth of nominal selling price of residential buildings in Shanghai, Shenzhen and the national average, versus national nominal GDP per capita growth
(Index 100=2002)

*Source: National Bureau of Statistics of China (NBSC)*

# 1 Institutional Background

All land in China is ultimately owned by the government. Land leases are supplied by local governments to property developers in an auction-based system. Property developers bid to lease parcels of land for a period of up to 70 years for residential buildings (Wu, Deng, and Liu 2014). Housing units are built and sold by property developers to households. During the leasehold period, households have the right to live in, sell, or rent their housing unit (Wu, Deng, and Liu 2014). These rights were gradually introduced as part of China's overall market-based economic reform, beginning in 1978. By the turn of the millennium, 80 percent of housing was privatized in most provinces, and 100 percent in Shanghai (Chen, Guo, and Wu 2011). The transition of housing from a

public to fully-commercialized good over the past few decades is considered one of the largest social experiments in the history of housing policy (Lim and Lee 1993).

Housing in the People's Republic of China began as a state allocated welfare good. Prior to reform, residential housing was guaranteed, standardized, and subsidized by the government (Lim and Lee 1993). Housing was part of a household's employment compensation package. By the beginning of the reform period, it was becoming a financial burden on the state allocation system. Urban labor compensation was often characterized by low static wages, low savings, and cramped living conditions; and in many cases, the rents collected on housing were insufficient to cover minimal maintenance costs (Tolley 1991). Since funds for housing came from the retained earnings of state-owned enterprises (SOEs), policymakers were concerned that housing was being financed at the expense of productive investment opportunities (Tolley 1991). Thus policy initiatives were started to separate the residential housing provision from employment compensation. In 1983, private property ownership was first written into the constitution (Chen, Guo, and Wu 2011). In 1988, as part of the Ten Year Reform Strategy the government established the terms of land use, allowing households to buy and sell property (Chen, Guo, and Wu 2011). In 1994, the Housing Provident Fund (HPF) and the introduction of mortgage loans was established to make homes more affordable (Claus et al. 2014).

In 1998, the government officially ended the employer-based welfare housing system, which marked the beginning of China's modern market-based system (Chen, Guo, and Wu 2011). Between 1998 and 2002, in the aftermath of the 1997 Asian Financial Crisis, the People's Bank of China (PBOC) lowered home mortgage rates five times (Fang et al. 2015). By 2005, China had become the largest residential mortgage market in Asia with mortgage loans growing from 264 million CNY to 2 trillion CNY between 1998 and 2005 (Deng and Liu 2009).

Leading up to the 2008 Global Financial Crisis (GFC), the housing market was growing substantially. Therefore, the government instituted various policies to curb soaring prices (Fang et al. 2015). These policies included raising the minimum down payment on mortgage loans from 30 percent to 40 percent, raising the interest rate on second mortgages, imposing a capital gains tax on housing transactions, and constructing low-income subsidized housing to relieve pressure on prices (Fang et al. 2015). In the wake of the GFC many of these policies were reversed. More accommodative policies resumed to promote economic growth (Fang et al. 2015). Real land prices, which fell about one-third between 2007 and 2009, recovered significantly, doubling from 2009 to 2010 (Deng et al. 2011).

Housing is regarded by policymakers as a major driver of economic growth (Chen, Guo, and Wu 2011). Half of all loans in China are directly or indirectly linked to the real estate market (Dobbs et al. 2015). Between 2000 and 2016 real estate investment grew from approximately 5 percent to 14 percent of GDP, with residential buildings comprising over two-thirds of total real estate investment (Figure 2). Today, China's housing market is the largest in the world with an annual production of 10 million new units and a total market value of approximately $1 trillion USD (Claus et al. 2014). The size of the Chinese housing market and its significant contribution to economic growth makes it an important system to understand. Policymakers are challenged with promoting growth through real estate investment, while preventing prices from soaring out of control and collapsing. To understand potential driving forces behind China's housing market, the next two sections present a discussion of variables shown to explain home prices, followed by the econometric test and analysis.
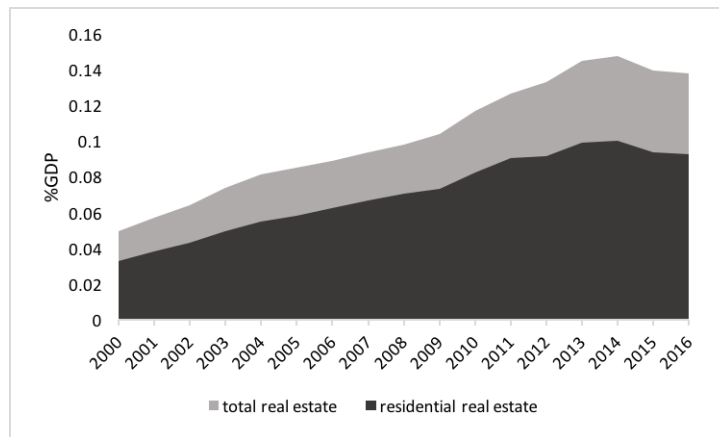


Figure 2: Real Estate Investment
Commercial and residential property investment as a percentage of GDP
*Source: National Bureau of Statistics of China (NBSC)*

## 2   Literature Review: Explaining Home Prices

This paper defines variables as being either fundamental — growth natural to a well-functioning economy; or non-fundamental — growth potentially harmful to the housing market and economy. The fundamental variables include household income, urbanization, and amenities; and the non-fundamental variables include local government deficits, and inventory buildup by property developers. The fundamental variables should promote sustainable growth, whereas, the non-fundamental variables suggest

the presence of a bubble in home prices and indicate an increase in risk of a housing market collapse.

## 2.1 Fundamental Variables

### 2.1.1 Household Income

Many studies identify income as having a significant impact on home prices (Case and Shiller 1990; Chen, Guo, and Wu 2011; Fang et al. 2015; Chow and Niu 2015; Jin et al. 2006). Chen, Guo, and Wu (2011) run a linear regression on home prices and disposable income growth, finding that income is highly significant in explaining home price appreciation in China. They warn, however, that since 1998 the rate of income growth has lagged the rate of home price appreciation. If this unsustainable trend persists, it could lead to an overvalued housing market and a sharp correction if prices reverse.

Over the last decade, average home prices in first-tier cities namely Beijing, Shanghai, Guang-zhou, and Shenzhen have been rising faster than average wages (Figure 3). Between 2002 and 2016, the average annualized growth rate in nominal home prices in first-tier cities was 14.4 percent, while the average annualized growth rate in nominal wages was 10.8 percent during the same period. Among second-tier cities within the sample,[1] home prices have actually lagged wage growth (Figure 4). Average annualized nominal home prices grew at 10.1 percent between 2002 and 2016, while average annualized nominal wages grew at 12.4 percent. The national average is similar to the second-tier city average. Nominal home prices, nationally, have been growing at an average annualized rate of 9.2 percent, while nominal wages have been growing at 13.0 percent (Appendix: Figure 19).

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1. The 35 city sample from the NBSC is comprised of 4 first-tier cities, 27 second-tier cities, and 4 third-tier cities. In this study, first-tier cities will refer to Beijing, Shanghai, Guangzhou, and Shenzhen; and the remaining 31 cities will be referred to as second-tier cities. These second-tier cities include Tianjin, Shijiazhuang, Taiyuan, Hohhot, Shenyang, Dalian, Changchun, Harbin, Nanjing, Hangzhou, Ningbo, Hefei, Fuzhou, Xiamen, Nanchang, Qingdao, Zhengzhou, Wuhan, Changsha, Nanning, Haikou, Chongqing, Chengdu, Guiyang, Kunming, Lanzhou, Xining, Yinchuan, Urumqi, Jinan, and Xi'an.
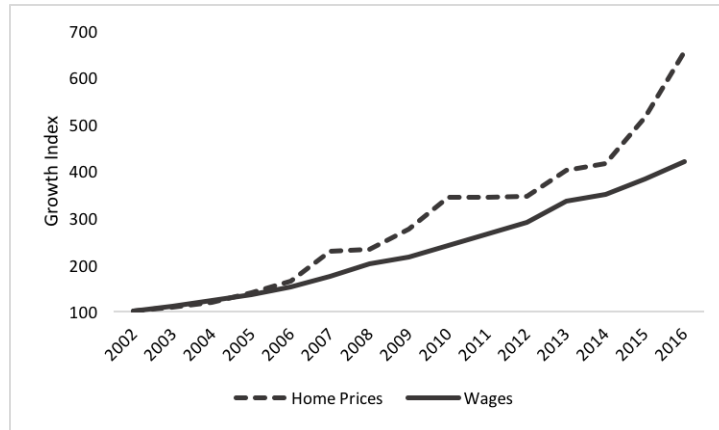
Figure 3: Tier-1 City Home Prices & Wages

Annual growth in average nominal price per square meter of residential buildings and average nominal wages in first-tier cities (Index 100=2002)

*Source: National Bureau of Statistics of China (NBSC)*



Figure 4: Tier-2 City Home Prices & Wages

Annual growth in average nominal price per square meter of residential buildings and average nominal wages in second-tier cities (Index 100=2002)

*Source: National Bureau of Statistics of China (NBSC)*

Wages appear to be growing faster than home prices in China, except in first-tier cities. This means that outside of the four largest markets, home prices are exhibiting a sustainable growth trend. Fang et al. (2015) emphasize the importance of income growth expectations to a household's willingness to pay for housing. They analyze mortgage loan data on home buyers from 120 cities across China, while accounting for current borrowing conditions including a minimum down payment of 30 to 40 percent and a mortgage rate of 6 percent. The study determines that the average Chinese household

will be able to afford a home worth 8 to 10 times their annual income, as long as annual income growth continues at 6 to 7 percent into the future. Wu, Gyourko, and Deng (2015) conduct similar calculations to identify the sustainable price-to-income ratio for Chinese households. Accounting for a 30 percent minimum down payment and a 6.55 percent interest rate, the maximum implied price-to-income ratio that they deem sustainable by Chinese households is 9.4. From an underwriting perspective, in developed economies, mortgage lenders consider a price-to-income ratio of 3 being problematic (Wu, Gyourko, and Deng 2015). Therefore, China's expected income growth is critical to justifying home price multiples as high as 9 times annual income.

This paper constructs its own price-to-income ratios for the 35 city sample. Based on data from the NBSC, the average family size is 3 individuals, the per capita living space is approximately $30m^2$, and the average number of wage earners per household is 1.5. Therefore, the price-to-income ratio can be calculated by the average price per square meter of residential floor space multiplied by 90 (the average household size per square meter determined by multiplying the average family size of 3 by the per capita living space of $30m^2$), divided by the city's average annual wage multiplied by 1.5 (the average wage earner per household). Based on these calculations, the national average price-to-income ratio was around 6 in 2016. It had steadily declined from 12 in 2000 (Appendix: Figure 20). The national average is well below underwriting standards of 9.4 suggested by Wu, Gyourko, and Deng (2015), and implies that housing on a national scale has become more affordable over the last decade and a half. Out of the 35 city sample, eight cities show price-to-income ratios of 10 or greater. This includes all four first-tier cities, as well as four second-tier cities, including three provincial capitals Nanjing, Fuzhou, and Hangzhou and one special economic zone, Xia'men (Appendix: Figure 21). First-tier cities on average have a high price-to-income ratio of 16.5, while 31 second-tier cities have a low ratio of 6.5, and a declining trend similar to the national average (Figure 5). Thus, outside of the four largest urban markets, home prices on average appear to be rising on a sustainable trend.
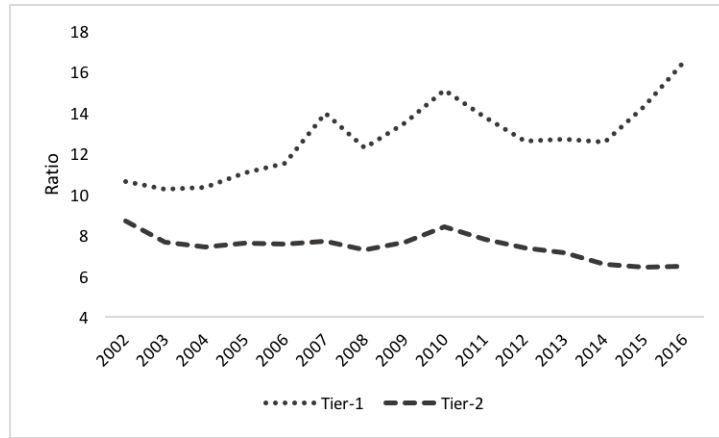
Figure 5: Price-to-Income Ratio

Average home price-to-income ratios of first and second tier-cities

*Source: National Bureau of Statistics of China (NBSC)*

Wu, Gyourko, and Deng (2015) also analyze price-to-rent ratios in China. Based on finance literature on asset pricing, namely the Gordon Growth Model, the price of a home is the present discounted value of its future housing service flows (Campbell et al. 2009). In a well-functioning market, housing service flows should be approximately equal to the rental value of the home (Krainer and Wei 2004). Therefore, the present discounted value of future rents should provide a fundamental value for home prices. The price-to-rent ratio can be a gauge for a rising trend in prices. Wu, Gyourko, and Deng (2015) analyze price-to-rent ratios in 12 major metropolitan markets and find no evidence of a rising trend, except in Guangzhou. The trend is flat in Shanghai, Tianjin, Chongqing, Wuhan, and Dalian. The trend declines in Hangzhou, Chengdu, and Xi'an. This provides support for contention that home prices are not increasing on an unsustainable path.

### 2.1.2  Urbanization

Urban population growth is another fundamental variable shown to explain home prices (Case and Shiller 1990; Chen, Guo, and Wu 2011). Urbanization should produce a positive shift in demand and put upward pressure on home prices. China has experienced large scale urbanization over the last several decades. The urban population grew from just 18 percent of the total population in 1978, to 59 percent in 2017 (Figure 6). This translates to an urban migration of over 390 million people or approximately 10 million people per year.[2]  Since housing is a fundamental need, demand for housing tends to

2. The author calculated this figure first by finding the average annualized growth rate of the urban population and total population within the 39 year period between 1978 and 2017 and then using the

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be relatively inelastic, therefore, urban population growth should put high pressure on home prices (Chen, Guo, and Wu 2011).
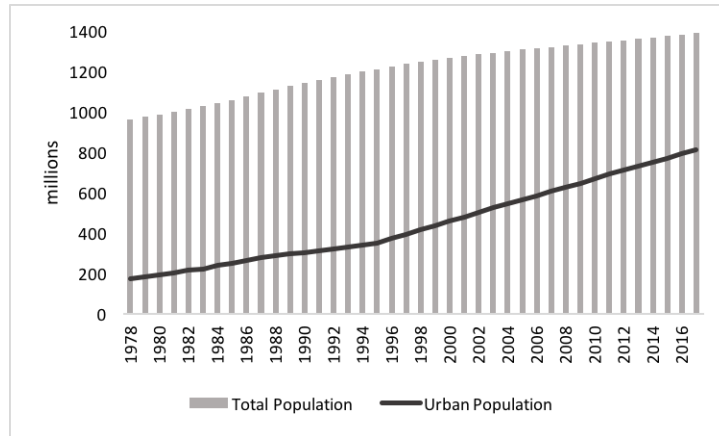


Figure 6: Urbanization

Urban population compared to total population between 1978-2017

*Source: National Bureau of Statistics of China (NBSC)*

With natural population growth rates relatively low due to the One-child Policy enacted in 1979, net migration has accounted for approximately 90 percent of new urban residents (Chen, Guo, and Wu 2011). In Chinese census statistics, migration is separated into two categories, permanent and temporary. This is based on an individual's household registration, or *Hukou*, which determines an individual's status as either an urban or rural citizen. Migrants with or able to obtain an urban *Hukou* are considered permanent migrants, and are counted as part of the city's official population. Migrants with a rural *Hukou*, are not counted as part of the city's official population and counted as temporary migrants or floating population. Data on floating population is unavailable on a city level, however on a national level, the total floating population has grown from an estimated 121 million in 2000 to 247 million in 2015 (Yearbook 2016).

A migrant worker living in a city with a rural *Hukou* is unable to enjoy the same benefits as an urban *Hukou* registered individual. With respect to housing, one of the major benefits is state-sponsored Urban Affordable Housing, which helps low-income households obtain housing below market value (Chen, Guo, and Wu 2011). Therefore,

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following formula:

$$\left( \left( \frac{1 + urban\ growth\ rate}{1 + total\ growth\ rate} \right)^{39} \times urban population 1978 level \right) - urban population 1978 level$$

*Source: National Bureau of Statistics of China (NBSC)*

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rural migrant workers must gain housing by renting or buying at market value, thus stimulating demand for higher home prices (Chen, Guo, and Wu 2011). The city level data on urban population used in this paper does not include temporary migrants or floating population, and thus, may effectively underestimate real population growth with respect to its impact on home prices. The effect that the real rate of urbanization has on home prices, therefore, may actually be higher than what the population growth variable tested in the following section captures.

Chen, Guo, and Wu (2011) test the effects of permanent versus temporary migration on the provincial level. They create separate variables for permanent migration (urbanization) and temporary migration (floating population), and test their effects on home prices in both inland and coastal provinces. They show that urbanization is significant at the 1 percent level for both inland and coastal provinces. Floating population appears significant at the 1 percent level for inland provinces, however, insignificant for coastal provinces. The interpretation is that the floating population may not actually stimulate growth in home prices in coastal provinces, which is illogical since coastal provinces are the main destination for rural-urban migrants (Chen, Guo, and Wu 2011). It may be that since coastal provinces tend to be more developed, and thus have higher prices, that rural migrants are priced out of the market. Also, Chinese data on urban population growth may just not be accurate enough to determine its effect on housing demand.

### 2.1.3 Amenities

Empirical studies conducted by Glaeser, Kolko, and Saiz (2001) find that high amenity cities tend to grow faster than low amenity cities. In their study, amenities include public services such as good schools and low crime, and aesthetics and physical setting such as beautiful architecture and weather. Other amenity factors include transport costs, and services and consumer goods such as restaurants and theaters. Glaeser, Kolko, and Saiz (2001) find that urban rents have grown faster than wages, suggesting that demand for living in cities stems from other factors such as amenities rather than higher wages alone. Traditionally, in the field of urban economics, cities tended to have advantages in production such as higher wages and disadvantages in consumption such as quality of life (Glaeser, Kolko, and Saiz 2001). Individuals chose to move to cities, tolerating a lower quality of life for a higher wage. As city income levels rise, residents begin to demand higher standards of living. In Chinese cities today, demand for a higher quality of life can be seen in the relationship between lower air pollution and higher home prices. Pollution is a negative amenity in a city. Decreasing air pollution in Chinese cities has been identified as a factor related to home price appreciation in several studies

(citewu2015; Zheng, Kahn, and Liu 2010; Funke, Leiva-Leon, and Tsang 2017).

The China Statistical Yearbook of 2016, provides city and national data on emission of sulfur dioxide, a byproduct of burning fossil fuels, most commonly from coal plants. In Beijing, one of the cities with the highest home prices, sulfur dioxide emissions have been reduced by 90 percent between 2004 and 2016. In contrast, China as whole has reduced emissions by only 50 percent (Figure 7). The variable for pollution in the following section is the last fundamental factor tested.
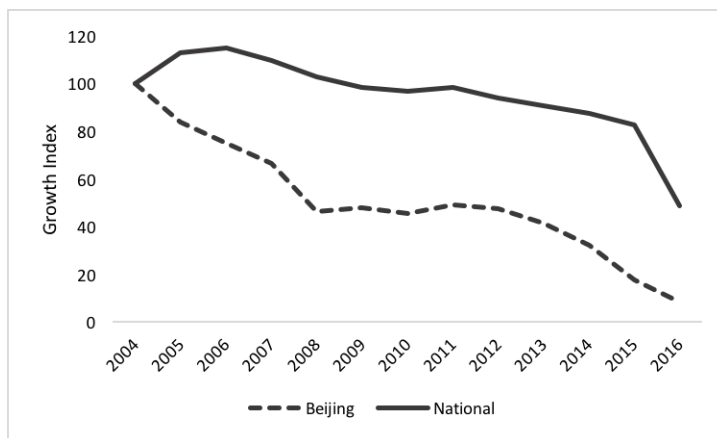


Figure 7: Pollution

Rate of reduction of sulfur dioxide ($SO_2$) emissions in Beijing versus the national average (Index 100=2004)

*Source: China Statistical Yearbook 2016*

## 2.2 Non-Fundamental Variables

### 2.2.1 Local Government Deficit

Since the 1994 Budget Law, local governments are prohibited from running budget deficits (Bai, Hsieh, and Song 2016). However, part of the 1994 law was a "tax sharing" provision wherein local governments were required to provide a larger proportion of their budgetary revenue to the central government (Wu, Feng, and Li 2014). After tax reform, the share of local budgetary revenue to national budgetary revenue decreased from around 78 percent to 44 percent, while the share of expenditure increased from around 70 percent to 85 percent, thus, local governments essentially have been running a deficit since 1994 (Wu, Feng, and Li 2014).

Land sales are a key source of local government tax revenue, accounting for as much as 40 percent (Wu, Gyourko, and Deng 2015). Local governments receive revenue from selling land lease agreements to property developers. Therefore, there may be an incen-

tive for local governments to sell higher valued land, in order to increase revenue and reduce the fiscal gap. Wu, Feng, and Li (2014) test whether budget deficits are a driving factor for home prices by regressing local government budget deficits on land prices in 35 Chinese cities. The study confirms that budget deficits have a positive effect on land prices. It denies, however, that budget deficits are the driving factor, and concludes that land prices are pulled more by demand-side factors.

If local government deficits are significant in explaining home prices then the decision to supply land is not based solely on market demand, and therefore, land may be misallocated. If local governments are pushing up land values for personal gain then there is a chance the market is in disequilibrium, suggesting a bubble and increasing the risk of a collapse in prices.

### 2.2.2 Inventory Buildup

Local governments control the supply of land through the land lease auction system. Property developers, therefore, tend to stockpile parcels of land to ensure ample supply for future opportunities, which leads to inventory buildup (Chan, Wang, and Yang 2011). The auction system, which encourages developers to purchase more land than current demand dictates, may lead to supply rigidity and sustained price inflation (Wang and Wang 2012).

Inventory buildup of uncompleted property held on developers' books can increase volatility in the housing market. Large building projects take time to realize profits. The size of the project can impede the ability to halt development when prices fall. This can lead to a sharp price correction and increase default risk of property developers. The gap between uncompleted construction and completed units has been widening drastically over the last decade (Figure 8). On a national level, the ratio of residential floor space under construction to floor space completed stood at 3.9 in 2016, higher than any other year. The amount of floor space under construction peaked at 6.9 billion square meters in 2014.
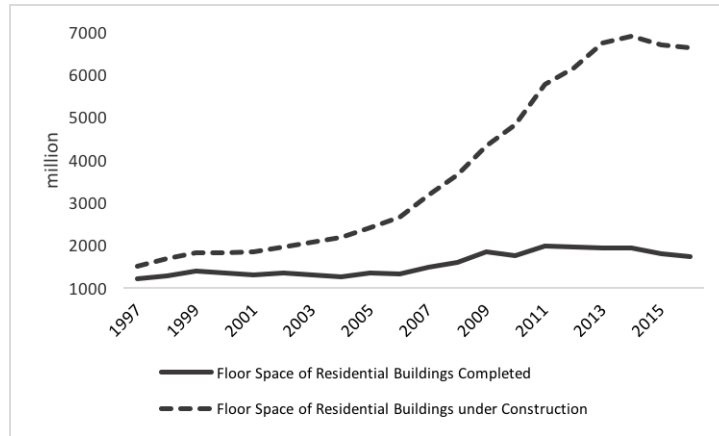
Figure 8: Inventory Buildup

Residential floor space under construction versus residential floor space completed by real estate enterprises on a national level (million $m^2$)

*Source: National Bureau of Statistics of China (NBSC)*

City level inventory data from the NBSC only provides total real estate construction as opposed to just residential buildings. However, residential building tends to comprise about two-thirds of total real estate building in China. Therefore, the figure for total real estate inventory buildup should also contribute to bidding up land prices and provides a measure of risk of property developer leverage. Inventory buildup has been increasing across first and second-tier cities in the 35 city sample (Figure 9). The average inventory buildup ratio in first-tier cities was 7.6 in 2016. Among first-tier cities in 2016, the inventory buildup ratio was 5.5, 5.9, 10.6, and 8.4 for Beijing, Shanghai, Shenzhen, and Guangzhou, respectively. Second-tier cities have been experiencing even higher inventory buildup ratios with an average of 9.4 in 2016.
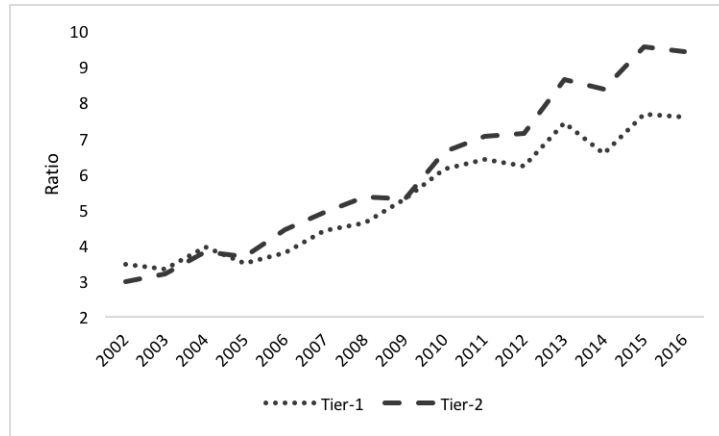
Figure 9: City-level Inventory Buildup
Ratio of real estate floor space under construction to real estate floor space completed
in first and second-tier cities
*Source: National Bureau of Statistics of China (NBSC)*

The risk property developers may be facing as a result of over-construction is exemplified by the amount of loans they have been receiving over the last decade. Banking in China, is dominated by state-owned institutions and the majority of lending is directed by government policy (Glaeser et al. 2017). Since housing plays a significant role in stimulating economic growth, property developers tend to receive favorable credit terms (Glaeser et al. 2017). Loans to property developers on a national level, between 2006 and 2016, increased at an average annualized rate of 15 percent, faster than nominal GDP (Figure 10). Many property developers are highly leveraged with debt (Glaeser et al. 2017). Therefore, higher credit levels in the real estate sector can increase volatility in the housing market. If interest rates rise to temper inflating asset prices, property developer default risk increases, which can lead to a sell-off of discounted property.

Figure 10: Property Developer Credit Levels
Bank loans to real estate development enterprises (nominal CNY)
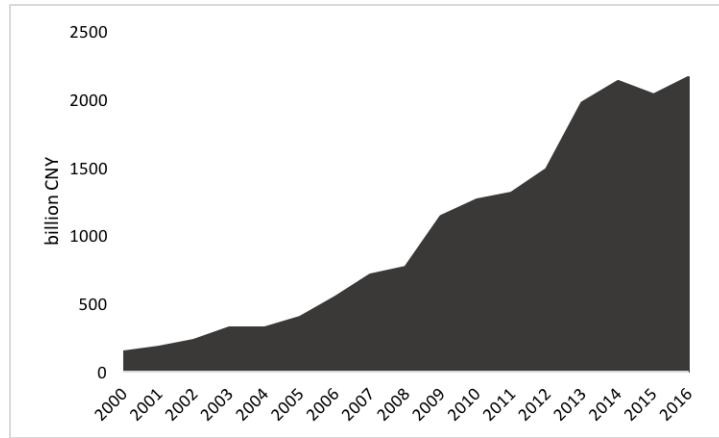*Source: National Bureau of Statistics of China (NBSC)*

The significance of the two non-fundamental variables, local government deficits and inventory buildup, in explaining home prices, indicates a systemic problem with the land auction system. If home prices are influenced by local governments setting higher land values and property developers bidding up land values because supply is fixed by local governments, then there may be a price bubble and an increased risk of a housing market collapse.

# 3   Empirical Analysis

This section tests the effects the fundamental and non-fundamental explanatory variables discussed in the previous section have on residential property prices in China. All variables are regressed in percent change to best avoid multicollinearity problems that may arise from a rising trend in the economic data. The goal is to identify which explanatory variables capture the most variation in the dependent variable, *home price*. Fixed effects are used to control for differences among cities across the 35 city sample. The results indicate that fundamental variables, real wage growth and pollution reduction, are correlated with rising home prices within the sample.

## 3.1   Data Description

All data were sourced from the NBSC, except for sulfur dioxide emissions which were sourced from the *China Statistical Yearbook of 2016*. The 35 city sample is from a period

between 2002 and 2016. All monetary values are adjusted for inflation in constant 2016 CNY using Chinese CPI data. Table 1 displays the descriptive statistics of each variable.

The dependent variable, *home price*, is the average annual real selling price per square meter of commercialized residential buildings. The average real price appreciation per square meter of floor space in the sample is 8.7 percent, and the standard deviation is 11.5 percent with a minimum to maximum range of -22 percent to 56 percent.

Table 1: Descriptive Statistics

| VARIABLES | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| home price | 490 | 0.0871 | 0.1150 | -0.2190 | 0.5571 |
| wage | 490 | 0.0953 | 0.0561 | -0.2754 | 0.5212 |
| population | 490 | 0.0143 | 0.0349 | -0.1430 | 0.4311 |
| pollution | 455 | 0.0051 | 1.0249 | -0.8730 | 20.7609 |
| deficit | 490 | 0.8812 | 16.7516 | -13.0805 | 368.9292 |
| inventory | 490 | 0.1158 | 0.3075 | -0.7327 | 1.8546 |

### 3.1.1 Fundamental variables

**Wage**

This variable is the percent change in average annual real wage of staff and workers within a city. The average annual real wage growth across the 35 city sample has been higher than the average annual real home price growth, with less volatility. However, the minimum range is lower by almost 6 percent.

**Population**

This variable is the percent change in the annual number of official city household registrants according to the *Ministry of Public Security*. It does not include rural *Hukou* migrant workers who may be living in the city for an extended period of time, thereby possibly stimulating demand for housing. This variable, therefore, may be effectively underestimating the real population growth.

**Pollution**

This variable is the percent change in annual volume by ton of sulfur dioxide ($SO_2$) emissions. There are several data points missing, which tend to come from the earliest periods (2002 and 2003) for each city. The range is very large, which may be from a

coal plant, for example, opening operations in the region. Otherwise, the trend in $SO_2$ emissions has been steadily declining in most cities. Therefore, the mean is most likely affected by these large one time increases, which is why the mean is a positive number.

### 3.1.2   Non-fundamental variables

**Deficit**

This variable is lagged one year, and represents an increase of the cities' budgetary deficit. A positive coefficient says that an increase in the budget deficit in the preceding year leads to an increase in home prices in the current year. The variable was created by subtracting revenue from expenditure, rendering most of the data points positive, since mostly all cities have been running deficits, except Hangzhou and Urumqi. The deficits are not large, which is why the changes in percent are large.

**Inventory**

This variable represents the rate of "over-building" in the city by real estate enterprises. It is created by dividing floor space of real estate under construction by floor space of real estate completed. The larger the ratio the more inventory buildup taking place in the city. More land being purchased by enterprises for construction should bid up the value of land and translate to higher home prices. Virtually all cities exhibit a steady upward trend in inventory buildup.

## 3.2   Model Specification

Below is the equation for the multivariate panel regression model with fixed effects.

$$
\begin{aligned}
homeprice_{it} = \alpha_i + \beta_1 wage_{it} + \beta_2 population_{it} + \beta_3 pollution_{it} \\
+ \beta_4 deficit_{it-1} + \beta_5 inventory_{it} + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

where subscripts $i$ and $t$ refer to the individual city and time, respectively. The $\alpha_i$ term is the unique intercept for each city $i$, and $\varepsilon$ is the robust error term.

## 3.3   Regression Results & Data Analysis

Running the regression in percent change allows the most significant variables to capture the most price variation in the dependent variable, while avoiding potential multi-

collinearity problems that may arise from constant trends in each variable. Tables 2 & 3 show the correlation matrix and a Variance Inflation Factor (VIF) test, which suggest a low chance of facing a multicollinearity problem.

Table 2: Correlation Matrix

|  | wage | population | pollution | deficit | inventory |
|---|---|---|---|---|---|
| wage | 1.0000 | | | | |
| population | -0.0841 | 1.0000 | | | |
| pollution | 0.0079 | 0.0211 | 1.0000 | | |
| deficit | 0.0164 | -0.0117 | 0.0017 | 1.0000 | |
| inventory | 0.0302 | -0.1027 | 0.2646 | -0.0436 | 1.0000 |

Table 3: Variance Inflation Factor

| VARIABLES | VIF | 1/VIF |
|---|---|---|
| inventory | 1.09 | 0.9158 |
| pollution | 1.08 | 0.9274 |
| population | 1.02 | 0.9802 |
| wage | 1.01 | 0.9922 |
| deficit | 1.00 | 0.9973 |
| Mean VIF | 1.04 | |

A Hausman test indicates that fixed effects are more appropriate to use than random effects, suggesting that there are unique differences to be accounted for across cities. The results show that the probability > $Chi^2$ = 0.0000, meaning a rejection of the null that the unique terms, $\alpha_i$, are uncorrelated with the regressors. City fixed effects, therefore, will be used. Time fixed effects, however, will not be as useful in percent change regressions, since $\Delta time$, each year, is equal to 1.

To identify the presence of heteroscedasticity in the fixed effects model, a modified Wald test indicates the results of a probability > $Chi^2$ = 0.0000, meaning a rejection of the null of no heteroscedasticity. Therefore, robust standard errors are used.

Table 4 displays the regression results. The variables shown to have significant impact on home prices are *wage* and *pollution*. The variables *population*, *deficit*, and *inventory* are either insignificant or provide no rational explanation for changes in *home price*.

The variable *population* has a negative coefficient, despite populations in all cities within the sample growing during the period, which should increase demand for housing. An interpretation can be that construction is expanding faster than demand generated from urbanization. However, it most likely has no effect because of migrant workers

Table 4: Regression results

| VARIABLES | CITY FIXED EFFECTS |
|---|---|
| wage | 0.37454*** |
| | (0.08510) |
| population | -0.14240* |
| | (0.08420) |
| pollution | -0.01683*** |
| | (0.00281) |
| deficit | -0.00058*** |
| | (0.00004) |
| inventory | 0.02119 |
| | (0.01407) |
| constant | 0.05220*** |
| | (0.4859) |
| Observations | 455 |
| Overall $R^2$ | 0.0457 |

Robust standard errors in parenthesizes.
*** p<0.01, ** p<0.05, * p<0.1.

being uncounted as part of the cities' official population. Migrant workers may, in fact, be putting pressure on housing demand, however, this is not captured in the *population* variable.

The variable *deficit* also has a negative coefficient, which is antithetical to the theory that higher local government deficits are pushing up home prices. A negative relationship implies that an increase in the deficit is followed by a decline in home prices the next period. Since the results are antithetical to the theory and the coefficient is small, this variable is rendered insignificant. The result says that local governments are not induced by budget deficits to manipulate land sales. It can further suggest that local governments are supplying land based on market demand and that land is not misallocated.

The insignificance of *inventory* suggests that property developers are not bidding up land prices by over-purchasing land leases from local governments. The perceived rigid supply from land being fixed by local governments may not be leading to sustained price inflation. Thus, the land auction system between local governments and property developers may not need to be improved. Property developers, however, may still be over-leveraged with debt and at risk of default. If property developers default, assets on developers' books may be sold at discounted prices leading to a correction in the real estate market. In a following section, an analysis on systemic risk will provide more insight on credit expansion and its impact on the housing market.

The interpretation of the significance of *wage* and *pollution* is that home prices in major Chinese cities can be explained by natural economic growth factors such as real wages and improved amenities. The risk of a housing market collapse, therefore, is determined lower based on the results that home prices are explained by fundamental variables as opposed to non-fundamental variables. Since wage growth and improved air quality are natural signs of economic prosperity, rising home prices may be justified. In order to fully evaluate the risk of a serious decline in home prices, however, other variables must be reviewed including the systemic risk generated by credit growth and construction.

# 4 Further Analysis: Missing Variables

There are other variables not tested that warrant examination in order to evaluate whether the Chinese housing market is at risk of collapse. This section provides further analysis on construction costs and vacancy rates. Construction costs have been shown to be misaligned with home prices, being either too low or varying widely across cities (Glaeser et al. 2017; Wu, Gyourko, and Deng 2015). There are also high vacancy rates in many

Chinese cities. A vacant home is neither lived in nor rented out, which contributes little to the real economy and is more at risk of losing value if prices decline (CHFS 2014).

The mass amount of construction in China, indicated by high inventory buildup and vacancy rates, suggests that housing supply is elastic (Glaeser et al. 2017). As demand shifts outward and prices rise, more building occurs in a relatively elastic market. Home prices, in theory, cannot stay above construction costs for too long in an elastic market (Glaeser, Gyourko, and Saiz 2008). Cities with elastic housing supply, therefore, should not experience a sustained price bubble. Cities with home prices high above construction costs and high vacancy rates, therefore, may be more inclined to experience a swift price decline as opposed to a prolonged bubble and severe collapse. Construction costs and vacancy rates are discussed in the next sections followed by brief policy implication that may help the Chinese government reduce the negative impact of a decline in home prices.

## 4.1  Construction costs

Case and Shiller (1990) show that income growth, population growth, and construction costs can accurately forecast home prices. Chow and Niu (2015) use a simultaneous equations framework to identify demand and supply forces that explain residential home prices in China, with income as the demand variable and construction costs as the supply variable. Although income and construction costs both show to affect home prices, the study determines that income is the main driving force behind home prices. Wu, Gyourko, and Deng (2015) build an index of construction costs comprised of building material prices, construction worker wages, and construction machinery expenses. They find that average real construction costs across 35 cities increased only 0.9 percent per year from 2004 to 2013, with Xi'an experiencing the highest increase of real costs of 17 percent, and Beijing actually experiencing a decrease in real costs of approximately 1 percent. Therefore, they conclude that construction costs cannot explain the sharp rise in home prices. Glaeser et al. (2017) also compare housing prices to construction costs and suggest that housing prices are too high relative to construction costs, especially in lower tier cities.

In a relatively elastic market more construction occurs when prices rise. According to finance literature on asset bubbles, if the supply of an asset is fixed or determined by a monetary authority, a rational bubble can occur (Glaeser, Gyourko, and Saiz 2008). Thus if supply is inelastic, a larger and longer sustained price increase should be exhibited. Housing supply in China is determined by local governments, however, supply is not

constrained by area, especially in inland cities, thus housing supply can reasonably be elastic. If supply is elastic, in theory, the duration of the bubble is shorter and the price decline is less severe. When prices increase more supply enters the market, which should bring down prices more rapidly (Glaeser, Gyourko, and Saiz 2008). In Chinese first-tier cities, home prices are rising high despite the market appearing elastic, thus according to theory, prices could soon fall. The government can prevent a decline in prices if it limits new construction, however, this may lower employment and productivity growth in the city (Glaeser et al. 2017). After vacancy rates are explained in the next section, ways the government might mitigate a sharp correction in home prices while supporting growth will be explored.

## 4.2 Vacancy rates

The China Household Finance Survey (CHFS) conducts a periodic report to determine vacancy rates. Vacant homes, according to the CHFS, fall under two categories: (i) "parted from housing" vacancy, where a home is fully-owned but vacant because the owner is away working in another region; and (ii) "more-than-one-unit" vacancy, where a household owns additional housing units that are neither lived in nor rented out. In 2013, "parted from housing" vacancy accounted for 5.1 percent of all vacant homes, and "more-than-one-unit" vacancy accounted for 17.3 percent.

Total vacancy rates have been on an upward trend from 20.6 percent in 2011 to 22.4 percent in 2013, and are high relative to global standards (CHFS 2014). For example, from similar surveys conducted in other regions of the world, vacancy rates were approximately 2.5 percent in the U.S. in 2011, 9.5 percent in the euro area in 2004, 13.1 percent in Japan in 2008, 4.7 percent in Hong Kong in 2010, and 17 percent in Taiwan in 2001 (CHFS 2014). Vacant homes are more at risk of a major decline in value if housing prices fall. In a time of crisis, homeowners are more likely to sell or foreclose on homes in which they do not live.

Vacancy contributed from "parted from housing" can be due to the *Hukou* system. Migrant workers with rural *Hukou* registration leave their countryside home vacant while working in the city for an extended period of time. Instead of being able to transfer their rural *Hukou* to an urban *Hukou*, thereby integrating into the city's official population and enjoying city benefits, they keep their countryside home as a form of social security. Vacancy contributed from "more-than-one-unit," which accounts for the majority of the total vacancy rate, can be due to housing being used as a store-of-value. Households channel their savings into additional homes as a financial asset for a return on invest-

ment. China's capital account is for the most part closed, meaning Chinese households cannot invest in foreign currency-denominated stocks, bonds, and other financial assets (Lardy 2012). Since Chinese households have limited access to international financial markets, they are not able to invest in a wide variety of diversified investment funds and are thus subject to lower rates of return (Fawley and Wen 2013). Real returns on China's stock market and bank deposits, have been approximately zero over the last decade (Glaeser et al. 2017). Figure 11 tracks the growth performance of the Shanghai Composite Index versus the average price appreciation of Shanghai homes since 2000.
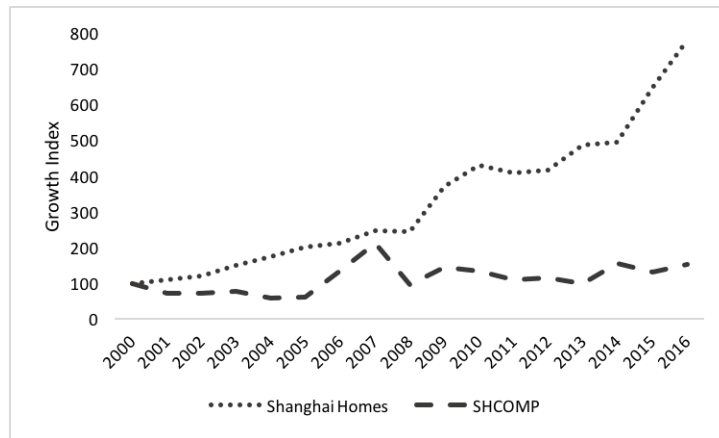


Figure 11: Shanghai Stocks vs Shanghai Homes
Shanghai Composite Index performance compared to average Shanghai home price appreciation (Index 100=2000)
*Source: National Bureau of Statistics of China and Bloomberg L.P.*

Since home prices have been steadily rising over the last decade, the concern for Chinese households purchasing homes as a store-of-value is that they may be doing so under false assumption that home prices will rise indefinitely. In Japan, for example, when the housing bubble burst around 1993, it look a decade until 2003, for home prices in the six largest metropolitan areas to return to their 1980 level (Kang 2018). Nowhere in the world have home prices continuously risen (Fawley and Wen 2013). Furthermore, housing is a necessity good for most individuals and the purchase of additional homes as an investment instrument inflates prices above what normal demand dictates. Lastly, vacant homes are rendered "inactive" in effect that they are not rented out to support real economic activity.

## 4.3  Conversion of Excess Inventory and Tax Policy

Similar to what the government did prior to 2008 when home prices were considered too high, increasing subsidized housing can put deflationary pressure on prices. The government can extend contracts to property developers to build low-income housing, as well as purchase excess inventory from developers to reduce buildup and help deleverage their balance sheets. This spending policy can be integrated along with *Hukou* reform to allow migrant workers more access to cities' low-income public housing programs. This would increase demand for low income housing, which would support construction and employment. This may involve heavy spending by local governments, however, with the financial support of the central government this policy may be implemented effectively.

Vacancy rates can be lowered by the government facilitating the development of rental markets so that empty apartments can be used more efficiently (Fawley and Wen 2013). The CHFS report, suggests offering tax exemptions on rent payments to induce households to offer their vacant homes as rental units. Similarly, a property tax could induce homeowners to "activate" and rent out their vacant homes by increasing the annual carry-cost of owning them (CHFS 2014). Converting inactive homes could benefit labor liquidity by providing easy access to temporary accommodation for migrant workers (CHFS 2014).

The Chinese government has discussed implementing a property tax to reduce the investment return on homes used as a store-of-value (Salm 2016). Currently, there are virtually no annual property taxes in China,[3] only a capital gains tax on property transactions, which can actually be an incentive for homeowners to buy-and-hold (Glaeser et al. 2017). A property tax would also provide an additional revenue stream for local governments. This could support extra spending on low-income housing projects. A property tax would also reduce the price developers are willing to pay for land, which would put further downward pressure on prices (Fang et al. 2015). With both conversion of excess inventory and an introduction of new tax policies, appreciation in home prices may be safely reduced.

# 5  Systemic Risk

Rising home prices and the pace of construction may also be adding to overall systemic risk. As China's economy develops, alternative sources of capital have emerged from

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3. As of 2015, both Shanghai and Chongqing assess property taxes of less than 1 percent on second homes (Fang et al. 2015).

shadow banking institutions, which may be fueling excess credit growth supported by higher land values. The traditional banking system in China is dominated by state-owned institutions, leaving many private property developers only able to access capital through shadow banking institutions (Ding et al. 2017). Property developers, using land as collateral and benefiting from higher land values, invest further in construction, fueling inventory buildup. If prices decline and credit contracts, construction can halt, stifling productivity and prompting a collapse in asset prices. This section begins with a review of the shadow banking system and its rising prevalence in China. This is followed by a discussion on rising credit levels and the risk it poses to the Chinese economy. Lastly, Japan's real estate market crash is reviewed, in order to understand potential causes of a collapse and determine if China faces similar risk.

## 5.1 Shadow Banking

Also known as *market-based* financing, shadow banking provides an alternative source of capital to an under-served private sector, which helps support real economic activity (FSB 2017). According to the Financial Stability Board (FSB) report, shadow banking is defined as, *credit intermediation involving entities or activities outside of the regular banking system*. The FSB categorizes shadow banks as Other Financial Intermediaries (OFIs), which are all financial institutions not classified as banks, insurance companies, pension funds, public financial institutions, central banks, or financial auxiliaries; and typically include trust, securities, and asset management companies (FSB 2017). In China, the state dominated banking sector lends primarily to large SOEs, leaving small and medium-sized companies in need of shadow bank financing (Liang 2016). Since there is typically higher counter-party risk dealing with smaller companies, shadow banking can increase systemic risk, especially if it is strongly interconnected with the regular banking system (FSB 2017).

The OFI sector makes up approximately 30 percent of global financial assets, while the traditional banking sector makes up 40 percent (FSB 2017). At the end of 2016, the euro area had the largest OFI sector with assets totaling $32.2 trillion, followed by the US ($27.1), China ($9.6 trillion), and the UK ($7.1 trillion). The euro area and US together make up 60 percent of total OFI assets.[4] Although China's OFI sector makes up a small portion globally, the rate of increase is significant and warrants concern. Since 2008, China has increased its share of global OFI assets from 2.2 percent in 2011 to 9.6 percent

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4. The FSB report samples 29 countries that make up approximately 80 percent of global GDP (FSB 2017).

in 2016, while the US and UK have decreased their share during that same period from 33.9 percent to 27.3 percent, and 11.3 percent to 7.2 percent, respectively.

By 2015, the shadow banking sector accounted for nearly half of new lending, and nearly half of all loans are tied to the real estate market in China (Dobbs et al. 2015). Shadow banking credit products from trust, securities, and asset management companies reached 58 percent of GDP in 2015 (Maliszewski et al. 2016). Many of these products are sold in the form wealth management products (WMPs) to corporate and wealthy individual investors (Kang 2018). Wealth management products (WMPs) have been among the fastest growing investment products in China in recent years (Wei 2015). Households channel their savings into these products since they offer higher yields, typically around 5.5 percent, compared to the standard 3 percent deposit rate (Liang 2016). Many shadow banking entities are "channel firms" — trust and asset management companies that are arms of major state-owned banks designed to keep WMPs off of the banks' balance sheets (Perry and Weltewitz 2015). Often times the risk is heightened by the use of leverage by asset management firms, which manage portfolios of WMPs on behalf of clients (Kang 2018).

Many of these trust and asset management companies are interconnected with the traditional state-owned banking system, but are off-balance sheet entities not regulated with the same oversight. The shadow banking sector is not held to the same standards as traditional banks with respect to reserve requirements, loss of reserves, loan-to-deposit ratios, lending rates, and industrial exposure (Liang 2016). Rapid credit expansion, higher credit risk, and interconnectedness with traditional banks with limited oversight, makes shadow banking activity a potential threat to the financial system.

Although steps towards financial liberalization have taken place over the years, the People's Bank of China (PBOC) still tightly manages interest rates (Neely 2017). The deposit rate has been kept close to the inflation rate, offering a real return of zero over the last decade (Glaeser et al. 2017). The deposit rate ceiling of 3 percent has led many banks to circumvent low rates of return by issuing WMPs through shadow banking institutions at higher yields to riskier borrowers (Wei, Zhang, and Liu 2017). Therefore, if the PBOC were to allow for a more free-floating regime potentially leading to increased interest rates, traditional banks would not have to use off-balance sheet shadow banks to circumvent low rates, thus increasing lending transparency and oversight (Wei, Zhang, and Liu 2017). Safer investment options would be extended to households, who might invest less in WMPs tied to the real estate market.

## 5.2 Credit Expansion

Credit growth from the end of 2008 to 2016 has been expanding by an average annualized rate of approximately 20 percent, considerably higher than nominal GDP growth (BIS 2018). In 2009, a fiscal stimulus program designed to boost economic recovery through public infrastructure projects was initiated by local governments through local government financing vehicles (LGFVs) (Bai, Hsieh, and Song 2016). The relationship between local governments and LGFVs has been in place since the 1980s, designed for public infrastructure spending (Zhang and Barnett 2014). Since local governments are prohibited from borrowing through the budget, using LGFVs is an off-balance sheet mechanism that allows local governments to spend and stimulate growth in their regions. The arrangement typically involves local governments transferring land use rights to LGFVs, and then the LGFVs using the land as collateral to borrow from or issue bonds through traditional banks and shadow banks (Bai, Hsieh, and Song 2016). Three quarters of the 2009 fiscal stimulus spending was done this way (Bai, Hsieh, and Song 2016).

Bai, Hsieh, and Song (2016) argue that the stimulus program funds may have been misallocated by local governments favoring local businesses. Liang (2016) describe these public infrastructure projects, typically in railroads, highways, and public housing, as having long gestation periods to generate economic profit, as well as sometimes being politically driven. An infamous case is the "ghost city" of Ordos in the Kangbashi district of Inner Mongolia, where apartment buildings were constructed to house four times the city's population (Liang 2016). Local government officials often times sign target responsibility contracts with superiors in higher levels of government to meet growth targets in their regions. Many of these targets are assigned to economic construction (Xu 2011). Local government officials, therefore, may have an incentive to over-stimulate construction to boost GDP growth and get promoted to higher levels of office. These short-run growth objectives by government officials may be one of the major reasons credit growth has increased so rapidly in the last decade.

Total debt in China as a percentage of GDP is now larger than that of the US, and has expanded faster than the average emerging market economy since 2008 (Figure 12). Data that encompasses credit borrowed through LGFVs is called non-financial private credit, since LGFVs are distinguishable from state-owned enterprises in Chinese statistics (Maliszewski et al. 2016). Non-financial private credit as percentage of GDP has risen from around 130 percent to over 200 percent from 2009 to 2017. This is a larger expansion, for example, than that of Japan in the nine years preceding its peak credit level, which experienced a credit expansion from approximately 165 percent of GDP to 215 percent from 1985 to 1993 (Figure 13).
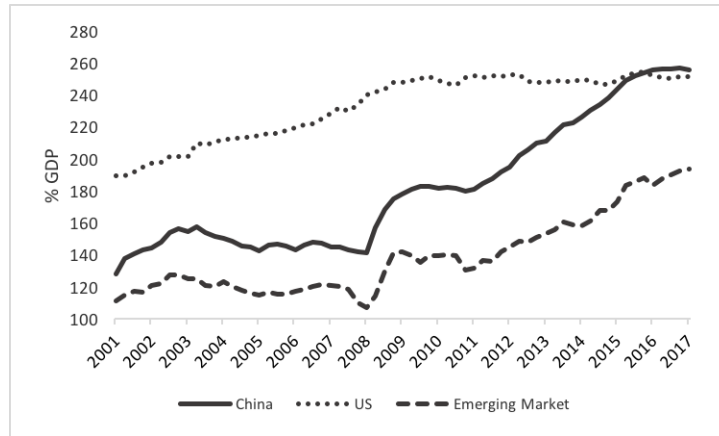
Figure 12: Total Debt to GDP

Total non-financial credit as a percentage of GDP in China versus the US and the
emerging market average

*Source: Bank for International Settlements (BIS)*

Japan's experience in the 1980s, with a burgeoning shadow banking sector and massive credit expansion levered by land collateral, can provide insight into ways China can manage its economy and avoid a housing market collapse. Japan's real estate market crashed in the early 1990s, followed by a period of persistent stagnation referred to as the 'lost decade' (Morinobu 2006). Either China is heading on a similar path, or its high GDP growth and high domestic savings channeled into investment can sustain its economic expansion in the near future.
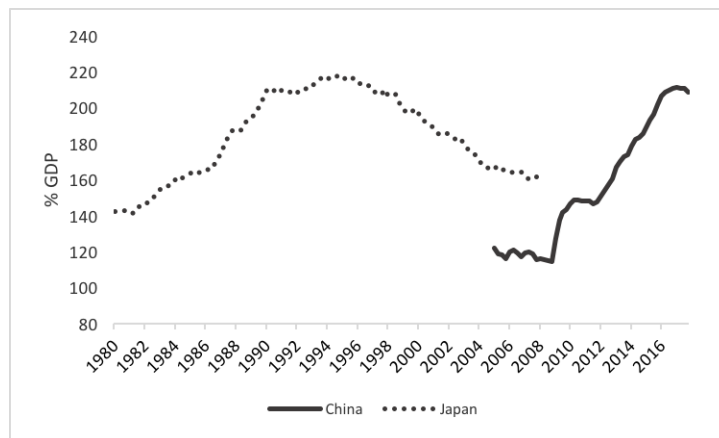


Figure 13: Private Credit to GDP

Non-financial private credit growth as a percentage of GDP in China from 2005-2017,
and Japan from 1980-2007

*Source: Bank for International Settlements (BIS) via Maliszewski et al. (2016)*

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## 5.3 Japan's Real Estate Crash

Many similarities can be drawn between Japan's postwar and China's post-reform era economies. Japan and China experienced similar paths of economic development including a protectionist stance towards international capital, an export-oriented growth model, high domestic savings and investment rates, and high government intervention in economic policy. Export competitiveness led both countries at one point to become the largest holders of foreign currency reserves. When integrating with the international community, both countries took gradual approaches to financial liberalization of their foreign exchange and capital accounts, particularly when Japan joined the Organization for Economic Cooperation and Development (OECD) in 1964 and when China was accepted into the World Trade Organization (WTO) in 2001 (Kang 2018). Furthermore, leading up to Japan's real estate market collapse in the early 1990s, its accumulation of credit and soaring property prices resembles China's current predicament. Understanding Japan's economic background leading up to its real estate market crash can provide lessons on ways China can deal with the systemic risk facing its housing market.

Land in Japan acted as the fulcrum of economic development. Japan was known as a "construction state," and undertook large public expenditure projects relative to other nations (Tsuruta 1999). With land as the main form of collateral, the government directed bank lending to strategic industrial sectors (Hoshi and Kashyap 2004). A false notion began to surface, which became known as the "land myth" or "land standard," based on the presumption that land values would never decrease due to the country's limited area and cultural preference to own homes (Morinobu 2006). With the collateral asset of land reliably increasing, bank lending was robust and large export-oriented manufacturing firms benefited from cheap credit. The land on which manufacturing plants were built, continued to rise and push up company book values, justifying higher stock price multiples. With increasing equity values, companies could issue more shares at lower costs and purchase more fixed capital and land, increasing land prices further and stimulating a large wealth effect (Tsuruta 1999).

The success of state supported export manufacturing firms led to a massive trade surplus. By 1985, Japan had become the largest creditor country in the world (Kang 2018). The US was one of Japan's largest borrowers and pressured Japan towards financial liberalization, in order to balance its trade deficit. Similarly in recent years dealing with China, the US accused Japan of currency manipulation, claiming that the Bank of Japan's (BOJ) choice to stockpile foreign currency reserves was depressing the value of the yen in order to gain advantage in export competitiveness in its automotive industry (Frankel 2015). Nevertheless, Japanese policymakers were confident that a more free-

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floating currency regime could be achieved (Kang 2018). The large stockpile of foreign currency reserves could be used to buy yen-denominated assets in case of lower export demand, and the large wealth effect from rising land and stock prices could increase domestic consumption, promoting import growth and internationalization of the yen.

The Plaza Accord agreement in 1985, ushered in internationalization of the yen and further liberalization of Japan's financial system. Up until the 1980s, Japan's economy was relatively insulated from international finance (Aramaki 2006). Foreign capital was restricted to what was deemed high-quality long-term investment capital in order to prevent short-term speculative capital or "hot-money" (Aramaki 2006). Japan opened its economy for inward FDI in 1984, and liberalized short-term cross-border capital flows in 1989 (Kang 2018). From 1980 to 1986, the government eased restrictions on the issuance and sale of euro-yen bonds, foreign CDs, and commercial paper (Kang 2018). Consequently, foreign financial institutions began buying yen-denominated securities causing a surge of foreign capital into the Japanese economy (Hoshi and Kashyap 2004). A growing shadow banking sector began offering companies more diverse capital raising options. Intense competition between traditional banks and shadow banks led to excessive lending (Morinobu 2006). Japan's large manufacturing companies became less dependent on traditional bank loans. Lending shifted from these companies to riskier real estate, construction, and small and medium-sized companies (Tsuruta 1999). The distribution of bank loans to manufacturing firms decreased from around 50 percent of total bank credit in the 1960s to 15 percent in 1990, while bank loans to real estate, construction, and other industries increased (Table 5) (Kang 2018).

Table 5: Japanese bank credit by industrial sector (%)

|                      | 1960  | 1970   | 1980    | 1990    |
|----------------------|-------|--------|---------|---------|
| Manufacturing        | 49.7  | 44.7   | 32      | 15.7    |
| Construction         | 2.7   | 4.7    | 5.4     | 5.3     |
| Real estate          | 0.8   | 3.8    | 5.6     | 11.3    |
| Finance              | 1.5   | 1.2    | 3.3     | 10      |
| Wholesale and retail | 28.9  | 28.8   | 25.5    | 17.4    |
| Other services       | 2.3   | 4.5    | 6.8     | 15.4    |
| Others               | 14.1  | 12.3   | 21.4    | 24.8    |
| Total                | 100   | 100    | 100     | 100     |
| (trillion yen)       | (8.1) | (39.2) | (134.6) | (376.0) |

*Source: Bank of Japan via Kang (2018)*

Land prices first began increasing in the commercial areas in Tokyo then spread across all major metropolitan areas and finally the entire nation (Tsuruta 1999). By the late 1980s, rising land prices were having significant adverse effects. A widening wealth disparity was occurring between those who owned homes and those who did not (Morinobu 2006). More criticism came from the US that high land prices were preventing foreign companies from starting businesses in Japan (Morinobu 2006). In major metropolitan areas, commercial land prices almost quadrupled and residential land prices almost tripled between 1985 and 1990 (Figure 14). Tokyo price-to-income levels were around 15 when the bubbled burst in the early 1990s (Fawley and Wen 2013).
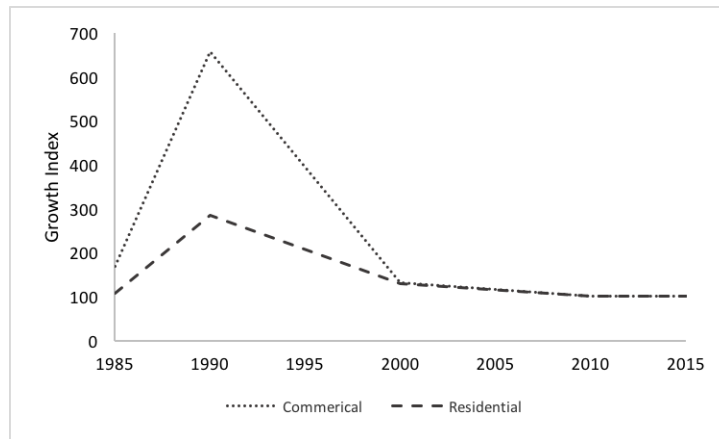


Figure 14: Japan's Land Value Index
Japan's land price index of six largest cities (Index 100=2010)
*Source: Japan Real Estate Institute*

Steps were taken to mitigate the risk of a hard landing. In retrospect, these steps may have exacerbated the problem or been enacted too late. The BOJ gradually raised the discount rate from 2.5 percent in 1988 to 6 percent in 1990 to curb soaring asset values (Kang 2018). Between 1990 and 1992, the government formally devised and introduced a series of tax reforms to eliminate the advantage of land used as an asset, thereby attempting to suppress speculation and promote effective use of land (Morinobu 2006). As a result of the taxes, land prices started to decline (Morinobu 2006). Falling collateral values and higher interest rates made debt obligations more burdensome, and in the early 1990s, a wave of defaults among property developers and securities companies began (Kang 2018). Between 1990 and 1996, falling stock and land prices resulted in a cumulative loss of approximately two years of GDP, or $7 trillion USD. From 1992 to 2017, annual real GDP growth in Japan has averaged less than one percent (World Bank 2018b).

As Japan's economic success story culminates in a real estate market collapse, China may be able avoid a similar outcome. Financial liberalization gave rise to shadow bank financing that channeled credit into riskier investment opportunities such as real estate. Chinese policymakers should make a concerted effort to reign in off-balance sheet shadow banking entities by providing more oversight on lending practices, especially with respect to sector exposure. Additionally, China should impose a series of land taxes before GDP growth slows any further. Beginning in 1990, Japan introduced a land value tax (national tax), property tax, and capital gains tax on transactions (Morinobu 2006). By 1990 however, interest rates had already been steadily increasing for about five years, and thus the combination of lower collateral values from the new tax system and increasing interest rates put financial stress many companies. Therefore, China should enact similar tax policies before higher interest rates are needed to slow rising asset prices.

A major difference between Japan in the 1980s and China today is their GDP growth rates. By the 1980s, Japan's growth had already begun to slow. Between 1961 and 1973 Japan's economy grew at an annualized rate of 8.7 percent (World Bank 2018b). After the global oil crisis of 1973 produced a negative shock in demand for Japanese goods, the economy grew at an annualized rate of 3.7 percent between 1974 and 1993. Although China's annual GDP growth rates have slowed in recent years following the GFC, they are still considerably higher than Japan's in the 1980s (Figure 16).[5]
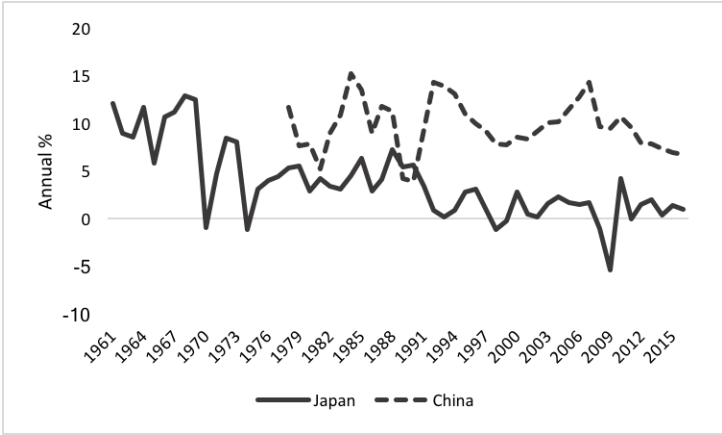


Figure 15: GDP Growth China vs Japan

Real GDP annual growth rates of Japan and China

*Source: World Bank national accounts data*

Japan's limited size meant that companies could not move to less costly areas of

5. From 2012 to 2017, real GDP growth in China has averaged 7.2 percent per year, compared to 10.9 percent in the previous six years from 2006 to 2011 (World Bank 2018b).

the country to increase productivity. China's vast hinterland may, therefore, be able to absorb productive capacity. Since 2008, the interior provinces are experiencing higher nominal growth rates than the developed coastal provinces. The western and middle provinces have been growing at an annualized rate of 12.7 percent and 11.1 percent, respectively, compared to 10.5 percent in the eastern provinces (NBSC 2018).[6] Furthermore, domestic savings and investment are higher in China versus Japan in the 1980s. In 1985, Japan's domestic savings as percentage of GDP was 33 percent compared to China's 42 percent in 2016 (Figure 16). Gross capital formation as a percentage of GDP was 30 percent in Japan in 1985 and 43 percent in China in 2016 (Figure 17). Domestic savings channeled into investment opportunities in the interior provinces where growth rates are higher, therefore, may be able to sustain high levels of economic expansion in China for years to come.
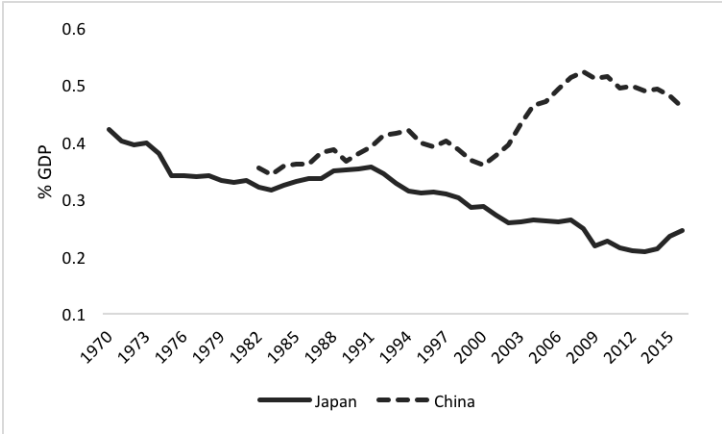


Figure 16: Savings Rate Japan vs China

Gross savings as a percentage of GDP of Japan and China

*Source: World Bank national accounts data*

6. The regions based on the official definition from the *National Bureau of Statistics of China* are as follows: **East** - Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan; **Middle** - Shanxi, Jilin, Heilongjian, Anhui, Jiangxi, Henan, Hubei, and Hunan; **West** - Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.
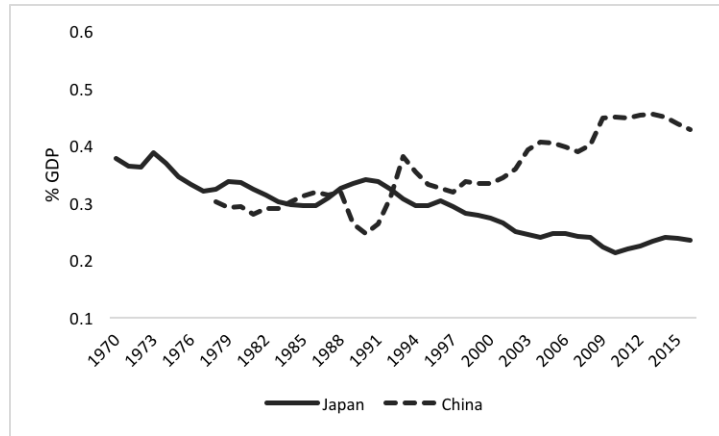
Figure 17: Investment Rate Japan vs China

Gross capital formation as a percentage of GDP of Japan and China

*Source: World Bank national accounts data*

# 6   Risk Evaluation

Soaring home prices, high residential vacancy rates, and inventory buildup indicate that the Chinese housing market may be at risk of overheating. A collapse similar to that of Japan, however, is unlikely. Property developers are highly leveraged, however, they are closely connected with state-owned banks (2017). State-owned banks are insulated by the PBOC and central government. The Chinese central government is not highly indebted relative to other major governments (Figure 18). Interest rates are higher relative to other large economies. Therefore, the central government can issue bonds to spend and the PBOC can reasonably conduct monetary policy to provide more liquidity to the market. Interest rates, therefore, can be lowered, banks can be recapitalized, and property developer debt can be restructured.
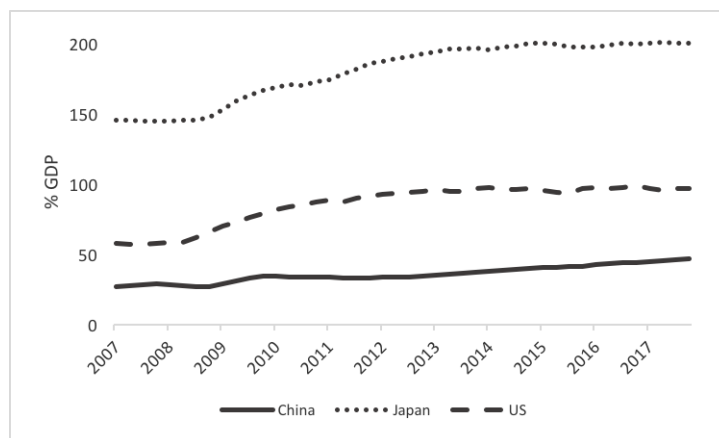
Figure 18: Government Debt

General government debt to GDP of China, Japan, and the US

*Source: Bank of International Settlements (BIS)*

Asset price busts tend to be more costly to the economy when the boom was financed with bank credit by leveraged institutions (Crowe et al. 2013). In the past, bursting real estate bubbles have been relatively mild and usually temporary events that cause little long-run damage when they are not accompanied by a banking meltdown (Glaeser et al. 2017). Therefore, if state-owned banks can be successfully recapitalized by the PBOC, the severity of a real estate market collapse should be low.

Additionally, households are not highly leveraged with mortgage debt (Glaeser et al. 2017). The minimum down payment of 30 percent imposed on households is relatively high (Fang et al. 2015). Mass foreclosure and repossession, therefore, are unlikely and thus the magnitude of a price decline should be small. If Chinese policymakers raise the minimum down payment and interest rate on second mortgages as they did prior to 2008, price appreciation may slow, allowing income growth to catch up in first-tier cities.

# 7   Conclusion

Home prices appear to be growing at an unsustainable rate relative to income in first-tier cities. The risk of a collapse in home prices, however, is low. Home prices are shown to be explained by fundamental factors such income growth and pollution reduction as opposed to non-fundamental factors such as local government deficits and inventory buildup. If the results indicated that local government officials were raising the value of land to generate more revenue or that the auction system was causing property developers to bid up land prices translating to higher home prices, then it could be argued that

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a bubble exists and the housing market is facing a greater risk of collapse. In second-tier cities, average price-to-income ratios have been decreasing, indicating a sustainable trend with income growing faster than home prices. Therefore, other forces must be contributing to higher home prices in first-tier cities, which may be households' use of additional homes as a store-of-value for their savings. In lieu of preferable investment options, households choose real estate in popular markets such as Beijing, Shanghai, Shenzhen, and Guangzhou. If further capital account liberalization occurs, and Chinese households are able to invest in more foreign currency denominated assets, demand for first-tier city homes should decrease to a larger extent.

The risk of collapse is intensified by slower productivity growth. China, however, is still experiencing high levels of growth relative to the world.[7] Furthermore, China's underdeveloped inland provinces are growing faster than its more developed coastal provinces suggesting more growth opportunities. Growth cannot continue at high rates indefinitely, however, given that there appears to be further development opportunities in China's vast hinterland, there is no reason to believe productivity growth will contract abruptly, thereby threatening a severe correction in asset prices. In the meantime, while growth is still relatively high, Chinese policymakers can implement a variety of acts that can help quell rising home prices including property taxes, tax exemptions on rental income, conversion of excess inventory, and further steps towards financial liberalization in order to bring shadow banking practices under more regulatory scrutiny and provide more diversified investment options to households. There are certainly risks facing China's housing market, however, a collapse similar to that of Japan's is perceivably a long way off.

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7. The emerging markets benchmark for real GDP growth between 2008 and 2016 has averaged only 5 percent per year (IMF 2018).

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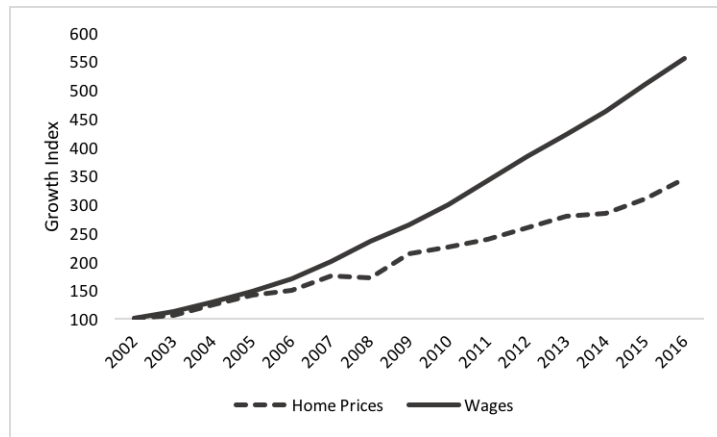
# A   Appendix



Figure 19: National Home Prices & Wages

Growth in average nominal price per $m^2$ of residential buildings and average nominal wages nationwide (Index 100=2002)

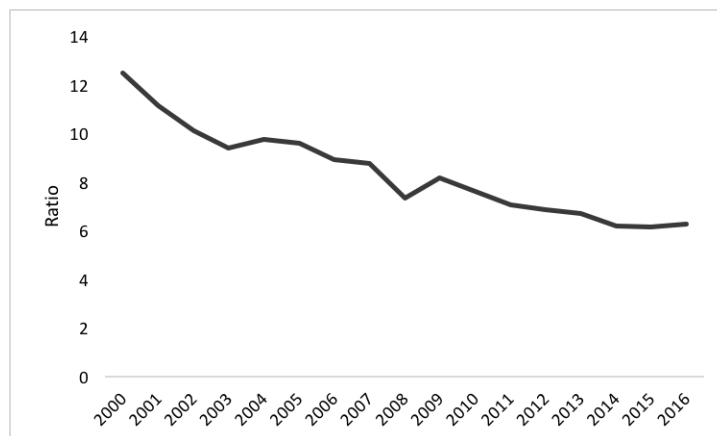*Source: National Bureau of Statistics of China (NBSC)*



Figure 20: National Price-to-Income

National average price-to-income ratio

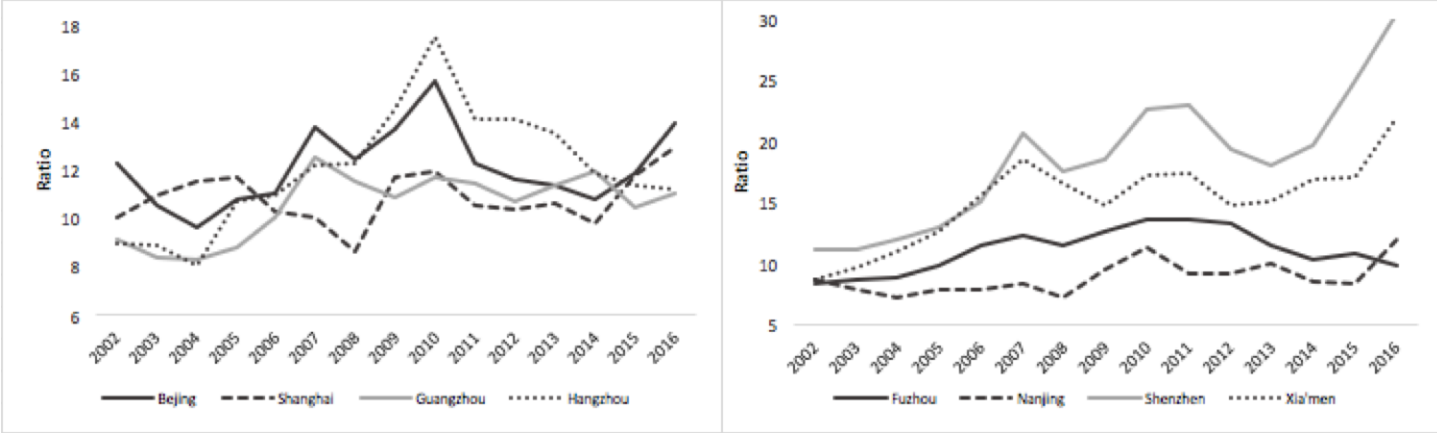*source: National Bureau of Statistics of China (NBSC)*

Figure 21: Highest Price-to-Income Cities

Eight cities with price-to-income ratios $\geq 10$

*source: National Bureau of Statistics of China (NBSC)*