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Time-varying real estate prices and urban household consumption – an empirical study on selected cities in China

Abstract

The vigorous development of the real estate market throughout China has resulted in real estate becoming a pillar industry in many cities. Real estate now makes significant contributions to both local and national economic development. However, as real estate prices in major cities continue to rise, housing becomes an increasing proportion of the typical urban resident's budget which causes real estate prices to have a major impact on urban household consumption. Any discussion of the challenges facing the Chinese economy should include the following topics: how to achieve a moderate and sustainable growth path for real estate prices, and how to stimulate domestic consumption at a time when the export sector of the economy is slowing down and facing some uncertainty. Hence, any study that provides insight into the relationship between real estate prices and domestic consumption is important and relevant. This paper carries out an in-depth study of the relationship between housing prices and consumption in twenty-three urban markets. The paper uses quantitative and qualitative analysis to study how real estate prices impact residents' disposable income and their consumption. The study also provides a theoretical basis with which to address the issue of affordable housing and the development of a healthy real estate industry.

Keywords: house price, consumption, wealth effect, crowding-out effect, fixed effect model.
JEL Classification: G10.

Introduction

The wealth effect of rising real estate prices on consumption is well known and well documented. As rising real estate prices increase household wealth this tends to increase household consumption. In a study that included 14 different countries and U.S. states, Case, Quigley and Shiller (2005) found housing wealth to have a rather large and statistically significant effect on household consumption. Similarly, in their study of 16 OECD countries during the 1990s, Ludwig and Sløk (2004) discovered that increasing housing prices are generally associated with increasing consumption.

Increasing home prices make homeowners wealthier and improve their outlook of their financial future. This wealth effect tends to increase household consumption. However, for consumers who have not yet purchased a house and who are still renting, increasing housing prices tend to push up rents, reduce their disposable income, and thus decrease their consumption. This is the crowding-out effect and it appears to be especially strong for the younger consumers.

Sheiner (1995) found rising house prices to have a positive effect on the savings rate of young people. These increased savings rates reduce their current consumption. Skinner (1989) found mixed results between housing wealth and savings rates when studied from a life-cycle approach. Attanasio, Leicester and Wakefield (2011) also used the life-cycle approach to study the relationship between housing wealth and consumption. They found housing wealth to have different effects on the consumption of older households relative to that of younger households. Using data from the UK, Campbell and Cocco (2007) found housing prices to have a greater impact on the consumption of older homeowners than on younger renters.

There is a significant body of literature studying the relationship between stock returns and consumption growth: Lettau and Ludvigson (2001), Duffee (2005), Yogo (2006), and Sousa (2010). Lustig and Van Nieuwerburgh (2005) study how both housing wealth and financial wealth affect consumption. Benjamin, Chinloy and Jud (2004) found that an "additional dollar of real estate wealth increases consumption by 8 cents in the current year, as compared with only 2 cents for financial wealth." This general result is confirmed by Kishor (2007), and Bostic, Gabriel and Painter (2009) who found housing wealth to have a greater effect on consumption than financial wealth. In their study, Carroll, Otsuka and Slacalek (2011) attempted to measure both the immediate and the eventual effects. They also found changes in housing wealth to have greater effect on consumption than changes in financial wealth. Using a panel of Australian data, Dvornak and Kohler (2007) found that both housing wealth and stock market wealth have significant positive effects on consumption.

Aoki, Proudman and Vlieghe (2002) suggested that financial innovation may also affect the relationship between housing prices and consumption in the United Kingdom. Because we cannot cite in Chinese, we refer readers to Shuyun Li's (2010) master's degree thesis at Jilin University for an extensive review of Chinese literature studying the effect of house prices on consumption in China.

In this paper, we carry out an in-depth study of the effect housing prices have on urban residents' consumption in China. We use quantitative and qualitative analysis to study the impact real estate prices have on residents' disposable income and their consumption. Our primary concern is whether increases in housing prices tend to increase or decrease urban consumption. We are interested in whether the net effect of increases in housing prices has a wealth effect or a crowding-out effect on urban consumption. Our paper provides both a reference and a theoretical basis with which to address the issue of affordable housing and the development of a healthy real estate industry in China. Thus, it has important theoretical and practical implications for the promotion of national economic growth.

1. Data and initial tests

While the Chinese real estate market is similar in many ways to Western countries, there are important differences. In 2013, The U.S. Census Bureau and U.S. Department of Commerce reported a 65% home ownership rate. While there are no such official statistics in China, the People's Bank of China and the Southwestern University of Finance and Economics released the *Chinese Household Financial Report* in 2012. They estimate the Chinese homeownership rate to be 89.68%, which is much higher than the 60% to 70% rates typically reported in most Western countries.

In China the government retains title to the land. When someone purchases a house or apartment in China they do not purchase the land but merely the right to use the land for a period of time. This right is typically granted for 70 years. However, it takes the developer time to acquire the rights and build out the houses or apartments. Therefore, when someone purchases real estate their right to use the land is typically less than 70 years. Mortgages are also different. Whereas 30-year fixed rate mortgages are common in the U.S., Chinese mortgages are typically for 20 years or less.

We use panel data for 23 cities in China from 2000 to 2008 to analyze the impact of housing prices on consumption. Quality data is not available prior to 2000 because the housing reform and commercialization of housing in China did not begin until 1998.

Urban residential consumption is our dependent variable, while the average sales price of houses and average personal disposable income are our independent variables. Personal income and consumption data are adjusted for inflation. This data came from the *China Statistical Yearbook* and the statistical yearbooks and statistical bulletins for each city. Table 1 provides the descriptive statistics.

We first use two common tests to see if the process is stationary: the LLC (Levin-Lin-Chu) test and the Fisher-ADF test. We cannot reject the null hypotheses that a unit root is present for the initial tests which used the logs of average sales price of houses, average personal disposable income, and urban resident consumption: log *hp*, log *y*, and log *c*. So we next tested the first order differences of the three log time series. The results of both tests indicate there is no unit root present at the 5% level of significance. These results for the tests of first order differences are shown in Table 2.

Table 1. Descriptive statistics of the data

	c	*y*	*hp*	*hpi*	Log *c*	Log *y*	Log *hp*
Mean	9,708.57	12,860.1	3,695.73	106.	9.11547	9.38412	8.08502
Median	8,835.00	11,729.0	3,009.47	106.	9.08647	9.36982	8.00941
Maximum	20,836.0	27,596.0	14,049.7	129.	9.94444	10.2254	9.55036
Minimum	1,321.00	5,500.00	1,377.00	85.8	7.18614	8.61250	7.22766
Standard deviation	3,578.86	5,225.57	2,135.86	4.86	0.36688	0.39300	0.49100
Jarque-Bera	30.571	26.2663	339.799	164.8	54.0664	7.29235	11.3601
Number of observations	216	216	216	480	216	216	216

Note: *c* is mean personal consumption; *y* is mean personal disposable income. Both *c* and *y* are in Renminbi yuan (RMB) per year per person. The average house sales price is represented by *hpi* in RMB yuan per square meter; *hpi* is a house sales price index.

Table 2. Panel data unit root test results

Variable	Original values		First difference	
	LLC test	ADF test	LLC test	ADF test
log *c*	5.26809	22.3218	-11.3826	108.544
log *y*	12.2221	4.46783	-11.998	86.9695
log *hp*	-0.06133	14.6495	-8.57756	101.975

As a result of our unit root tests, we test for cointegration using the Pedroni test. We estimate the error series μ_{it} in the regression function, $\ln c_{it} = \alpha + \beta_1 \ln y_{it} + \beta_2 \ln hp_{it} + \mu_{it}$ and then use the above unit root tests to determine if μ_{it} is stationary.

If μ_{it} is stationary, then there is cointegration among the logs of average sales price of houses, average personal disposable income, and urban resident consumption: log *hp*, log *y*, and log *c*.

Table 3. Test results for the stationarity of the error series μ_{it}

Test method	Statistics	*P*-value
LLC test	-5.70335	0.0000
ADF test	145.896	0.0000

Table 3 illustrates that both the LLC and ADF tests indicate the error series μ_{it} is stationary, and hence there is cointegration among the log time series of the three variables. Table 4 reports results of the Pedroni test. These results allow us to reject the null hypothesis that there is no cointegration among the log time series of average sales price of houses, average personal disposable income, and urban resident consumption. The results of these tests indicate that the results of the subsequent regressions should be valid.

Table 4. Pedroni error co-integration test

Null hypothesis: Common AR coefs. (within-dimension)				
	Statistics	*P*-value	Weighted statistics	*P*-value
Panel PP-statistic	-25.84311	0.0000	-13.42877	0.0000
Panel ADF-statistic	-1.161251	0.1228	-6.154106	0.0000
Null hypothesis: Individual AR coefs. (between-dimension)				
	Statistics	*P*-value		
Group PP-statistic	-17.69205	0.0000		
Group ADF-statistic	-5.624638	0.0000		

2. Estimation of the models

We used an *F* test and the Hausman test to determine the best model from the three possible static panel data regression models: the mixed regression model, the fixed effects model, and the random effects model.

First we perform an *F* test to determine whether we should use the mixed regression model or the fixed effects model. The hypotheses for the *F* test are:

H_0: $\alpha_i = a$ (all entities have the same intercept, mixed effect models).

H_1: the entities have different intercept α_i (fixed effect models).

We choose to use a 5% level of significance and define the *F* statistic as:

$$F = \frac{(SSE_r - SSE_u)/(N-1)}{SSE_u/(NT-N-K)}. \quad (1)$$

SSE_r is the mixed effect model residual sum of squares. SSE_u is the fixed effect model residual sum of squares. For a given level of significance, rejecting H_0 means the fixed effect model should be used. We use Eviews 6 to perform the test and calculate an *F* statistic of 2.1618 with a corresponding *p*-value of 0.0026. Hence we reject the null hypothesis and next determine whether we should use the fixed effect or random effect model.

We run the Hausman test to determine whether the fixed effect or random effect models is appropriate. The hypotheses for this test are:

$$H_0 : E(\varepsilon_{it} | X_{it}) = 0,$$

$$H_1 : E(\varepsilon_{it} | X_{it}) \neq 0.$$

If H_0 is rejected then the fixed effect model will be preferred. Otherwise, the random effect model should be chosen. The calculated statistic for the Hausman test is 4.247388 with a corresponding *p*-value of 0.1196. We are unable to reject the null hypothesis using the Hausman test which suggests the random effect model is appropriate. Table 5 provides the results of these tests on fixed or random effect models versus the mixed effect models. Table 6 details the choice between fixed versus random effect models.

Table 5. Fixed or random effect models versus the mixed models

	Statistics	d.f.	*P*-value
F test	6.073821	(23, 144)	0.0000
Hausman test	4.247388	2	0.1196

Table 6. Fixed versus random effect models

Variable	Fixed effect	Random effect
log*y*	0.873451	0.777648
log*hp*	-0.083877	0.024458

The results of the Hausman test suggest using the random effect model. However, the *p*-value is borderline at a 10% level of significance. So we consult Wooldridge's (2001) guidance for handling such situations and decide the fixed effect model is most reasonable. The cross-sectional fixed effect model gives the following regression equation:

$$\log c_{it} = 1.597 + 0.873 \log y_{it} - 0.084 \log hp_{it} + \mu_{it} \quad (2)$$
$$(4.0480) \quad (9.3821) \quad (-1.0157)$$
$$R^2 = 0.811, \ \overline{R}^2 = 0.786, \ F = 32.550.$$

The 0.786 adjusted *R*-square shows a good fit and that the explanatory power of the variables is significant. For the complete set of 23 cities, the regression results indicate that a 1% increase in the average sales price of houses will reduce the average personal annual consumption by 0.084%. The increase in housing prices has a crowding-out effect on consumption which causes most households to reduce consumption in order to pay for the higher-priced houses.

3. Analyses of results

In the aggregate, our results indicate rising house prices suppress rather than promote consumption. However, one might expect reasonable increases in housing prices to have a wealth effect and promote consumption. On the other hand, excessive increases in housing prices may have a crowding-out effect and actually suppress urban consumption.

We next use a variable coefficient model to calculate estimates of the cross-sectional variables, that is, estimates of the coefficients for each city. Table 7 shows these results.

Table 7. Coefficient estimates for different cities

City	Coefficient	City	Coefficient
Beijing	-0.110684	Fuzhou	-0.006152
Tianjin	0.038669	Xiamen	0.003845
Shijiazhuang	0.044050	Jinan	-0.006725
Taiyuan	-0.088503	Qingdao	0.107070
Shenyang	-0.028942	Zhengzhou	0.445643
Dalian	-0.005797	Wuhan	0.018728
Changchun	0.108641	Changsha	0.144574
Harbin	-0.258920	Guangzhou	0.234046
Shanghai	0.069638	Shenzhen	0.048515
Nanjing	-0.233393	Chongqing	-0.220602
Hangzhou	0.116470	Kunming	0.037865
Ningbo	-0.022063		

When evaluating the effect increasing housing prices have on consumption, Table 7 reveals considerable variation between cities. Some cities experience a wealth effect, while others cities experience a crowding-out effect. In Beijing, Taiyuan, Shenyang, Dalian, Harbin, Ningbo, Fuzhou, Nanjing, Jinan and Chongqing increasing housing prices lead to a decline in personal consumption. However, in Tianjin, Shijiazhuang, Changchun, Shanghai, Hangzhou, Xiamen, Qingdao, Zhengzhou, Wuhan, Changsha, Guangzhou, Shenzhen and Kunming increasing housing prices increase consumption. This result has interesting implications for any central government considering policies which will impact housing prices. The central government needs to understand that the impact on consumption will vary from city to city. Rising house prices will promote consumption in some cities while depressing consumption in other cities.

Table 8 presents additional data about each city which we collected from *Baidu Baike* and similar resources. Table 8 provides insight into the impact rising housing prices have on consumption in different cities. The area of each city is shown in square kilometers, the population in 10,000s, and annual GDP per capita in Renminbi yuan. The coefficients in Table 8 were taken directly from Table 7.

Table 8. Additional data for the cities

City	Coefficient	Area (square km)	Population (in 10,000)	Annual GDP per capita (yuan)
Beijing	-0.110684	16,411	20,69	87,091
Tianjin	0.038669	11,760	14,13	91,190
Shijiazhuang	0.04405	15,722	12,76	43,777
Taiyuan	-0.088503	6,959	4,20	55,034
Shenyang	-0.028942	12,942	8,23	81,429
Dalian	-0.005797	13,237	6,69	74,000
Changchun	0.108641	20,532	7,90	44,625
Harbin	-0.25892	53,100	10,64	39,896
Shanghai	0.069638	6,341	23,80	84,459
Nanjing	-0.233393	6,598	8,16	88,254
Hangzhou	0.11647	16,847	8,70	80,000
Ningbo	-0.022063	9,816	7,61	79,523
Fuzhou	-0.006152	12,177	7,85	53,865
Xiamen	0.003845	1,699	3,67	77,392
Jinan	-0.006725	8,177	6,81	60,000
Qingdao	0.10707	11,026	8,72	75,000
Zhengzhou	0.445643	7,507	9,10	61,000
Wuhan	0.018728	8,494	10,12	64,000
Changsha	0.144574	11,819	7,04	85,000
Guangzhou	0.234046	7,434	12,75	105,000
Shenzhen	0.048515	2,050	10,54	122,780
Chongqing	-0.220602	82,403	29,45	39,724
Kunming	0.037865	21,473	7,26	41,459

From Table 8 we calculate the correlation between the "Coefficient" variable and each of the remaining three variables: Area, Population and Annual GDP per capita. The correlation coefficient between "Coefficient" and "Area" is -0.4867. The correlation between "Coefficient" and "Population" is -0.2140. The correlation between "Coefficient" and "Annual GDP per capita" is 0.2204.

The area of a city and its population are both proxies for the city's importance. When people discuss real estate in China they refer to "first-line", "second-line", "third-line" cities, etc. The biggest, most important cities are the "first-line" cities. For example, Beijing is a "first-line" city. Real estate tends to be most expensive and therefore the most burdensome on ordinary wage earners in the "first-line" cities. One study estimated that at current prices a peasant would need to work one-thousand years or a factory worker would need to work 200 years in order to buy a small apartment in Beijing. "Second-line" cities tend to be smaller and less important while "third-line" cities are even less important. Second-line and third-line cities also tend to have progressively cheaper real estate. The negative correlation coefficients for "Area" and "Population" indicate that increasing housing prices depress consumption in larger cities where housing prices are already very high. This is not surprising. In cities with very high housing prices, where even the purchase of low-end housing is already very burdensome, any increase in housing costs will crowd-out consumption. In smaller cities, where lower housing costs require a smaller proportion of household income, rising housing prices will be less burdensome. Under these conditions, rising housing prices are more likely to create a wealth effect causing consumption to increase.

The positive correlation between the "Coefficient" and the "Annual GDP per capita" is consistent with this analysis. Higher annual GDP per capita indicates people are generally wealthier. Increasing housing prices will be less burdensome in wealthier cities than in poorer cities. Therefore, in cities with high "Annual GDP per Capita" the wealth effect might increase consumption. In cities with low "Annual GDP per Capita" increasing housing prices will be more burdensome and the wealth effect is likely to have less impact on consumption.

Based on the data, analyses and discussions we are tempted to formulate a hypothesis that goes beyond these 23 cities and possibly even beyond China. As we write this paper, the easy money policies of various Western governments' are re-inflating housing bubbles. In China, whenever the housing market has shown any signs of distress, the government has repeatedly initiated huge monetary and fiscal stimulus plans which have not merely supported the real estate market but which have pushed real estate prices to ever increasing levels. How long can this continue? Can increasing real estate prices continue to increase consumption and stimulate the economy? Our analysis suggests that moderate increases in housing prices will create a wealth effect which will promote consumption and stimulate the economy only when housing prices are at reasonable levels. On the other hand, when housing prices are extremely high, increasing housing prices will create a crowding-out effect and diminish consumption. Policy makers must realize that there are conditions when monetary and fiscal stimulus may push housing prices to levels so excessive they end up reducing consumption and damaging the economy. Proving such a hypothesis is a beyond the scope of this paper. However, if true, this hypothesis would have tremendous policy implications for governments around the world.

Conclusion

Using yearly panel data from 23 cities in China, we analyzed the impact of rising housing prices on urban household consumption. The overall results show that in these Chinese cities, rising house prices tend to decrease personal consumption. Every 1% increase in the sales price of houses results in a 0.084% reduction in the average personal consumption. In general urban households have to reduce consumption in order to pay for the higher housing prices.

This effect does vary from city to city. But in general, there are more cities where rising house prices depress consumption than cities where rising house prices increase consumption.

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