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# Real Estate Prices and Consumption in China: 1998-2011

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**Abstract:** The government of China puts forward expanding domestic demand to ensure the healthy and continuing development of the China's economy. In theory, the changes of real estate prices may influence the growth of consumption through wealth effect and then influence economic development. The paper studies the relationship between real estate prices and consumption in China, with China's 30 provinces, municipalities, autonomous regions' annual data in 1998-2011, using an individual fixed effects model. The results show that the rise of real estate prices in China can promote consumption based on credit by increasing the value of the collateral, while can reduce consumption based on consumer's own wealth by increasing deposit for future real estate purchase. Totally, the rise of real estate prices in China suppresses consumption. Therefore, the sustaining and effective regulation of real estate market is conducive to the growth of domestic demand and then is conducive to the sustaining and healthy development of the China's economy.

**Key words:** Real estate prices, consumption, domestic demand, wealth effect, credit

## INTRODUCTION

Since the reform of China's real estate market in 1998, the real estate industry has become one of the important engines driving the rapid growth of the China's economy. The proportion of real estate assets in total household wealth held by Chinese residents has been in an upward trend. The real estate prices' fluctuation influences on consumption and investment and then on the growth of the national economy more and more.

The overheated real estate market could cause a real estate asset bubble. In 2007, the US subprime mortgage crisis has set off a worldwide economic shock. Since the end of 2007, the China's real estate market has also taken a rest, due to the ongoing real estate market regulation policies and the other international and domestic factors.

In 2009-2012, although the China's real estate market picks up signs once again, but on the condition that the severe real estate market regulation could be going to go on in a long time, the level of the China's real estate prices remain stable.

Today, the China's government puts forward boosting economic development based on the expansion of domestic demand. In theory, the changes in real estate prices may influence the growth of consumption through wealth effect and then influence the economic development. Then, whether the rise of China's real estate prices boosts the consumption through wealth effect? And when real estate prices is steady or even going to decline in the future, how could consumer be influenced?

The paper, with 30 provinces, municipalities, autonomous regions' annual data in 1998-2011, studies the relationship between China's real estate prices and consumption, using an individual fixed effects model, in order to inspect whether there is the wealth effect which the development of China's real estate market brings forth. The study is important for China to further stabilize the expansion of the consumption on the basis of the healthy development of the real estate market and then to support the sustaining and healthy economic growth.

## LITERATURE REVIEW

The narrow wealth effect only includes the impact of the changes in asset prices on consumption, while the broad wealth effect includes the impact of the changes in asset prices on both investment and consumption.

There are three kinds of opinions on the question that whether the changes of real estate prices produce the narrow wealth effect.

Some scholars believe that the impact of real estate market's wealth effect is very little or even almost non-existent. Elliott (1980) studies, based on Friedman's permanent income model and believes that cash and risk financial assets have strong explanatory power on consumption, while because the purchasing power of savings and non-financial assets is difficult to achieve, savings and non-financial assets has no explanatory

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power on consumption. Levin (1998) studies empirically on the basis of the life-cycle model and Ando and Modigliani (1963) study making use of behavioral finance theory. Their research results show that real estate market's wealth effect does not exist. Thaler (1990) and Hoynes and McFadden (1994) also believe that there is no wealth effect which real estate market brings forth.

Most scholars believe that real estate market's wealth effect exists significantly, although their opinions on the size of wealth effect and on the question whether it works positively or negatively are different from one another.

Peek (1983) does not agree with Elliott (1980) and believes that Elliott (1980) does not measure the real value of non-financial assets accurately enough. Peek (1983) retests empirically and finds that real estate assets have a significant impact on consumption because real estate assets make up a large proportion of total assets. Skinner (1989) establishes a simulation model to study and finds that real estate market's wealth effect is small but significant. Elmendorf and Sheiner (1999) support Skinner (1989) and believe that the rise of real estate prices urges residents to increase savings for future real estate purchase and therefore the increased savings for future real estate purchase offsets increased current consumption. Cheng and Fung (2008) establish a VAR model and make an empirical research on the basis of the Permanent Income Hypothesis (PIH). The results show that real estate prices' rise has positive and negative effects on consumption at the same time and that the positive effect stems from the consumer's increased capital gains while the negative effect stems from the increased cost of future real estate purchase. The results also show that real estate market's wealth effect changes with the change of leverage rate. There are many similarities among Cheng and Fung (2008), Skinner (1989) and Elmendorf and Sheiner (1999).

Most of the early empirical studies are based on time-series data. Since 2000, more and more scholars have used the panel co-integration technique to inspect the wealth effect of real estate market in developed countries. The results show that the wealth effect is significant and positive. The representative literatures include Boone and Girouard (2002), Tang (2006), Dreger and Reimers (2004) and Leonard (2010) and so on.

With the development of the study on wealth effect, more and more measuring methods are applied in theoretical or empirical studies. Carroll (2004) proposed a new MPC measuring method which divides real estate wealth effect into the immediate effect and the long-term effect. The research result shows that the size of the immediate effect is about 1.5 cents per dollar, while the size of the long-term effect is about 9 cents per dollar.

Carroll *et al.* (2011) amend Carroll (2004) and take "sticky expectation" into account to make an empirical test again and find that the U.S. long-term effect is still about 9 cents per dollar, while the immediate effect is about 2 cents per dollar.

Navarro and de Frutos (2012) found a dynamic multi-equation model to study the effect on consumption of a fall in real estate wealth and real estate prices that results from a rise in interest rates and finds that there are obvious differences between the effects of long run and short run. Salotti (2012) studied the wealth effect's work on consumption during the period in 1989-2007, using a household-level cross sectional dataset. The results indicate a higher elasticity of consumption with respect to income and a lower elasticity of consumption with respect to both real estate wealth and other financial wealth.

The studies on real estate wealth effect are massed and there are many differences in their conclusions. Today, the development of China's real estate market has been going into a new stage and the amount of data is richer than before. Therefore, it is necessary and possible to re-examine the wealth effect of the real estate market in China more accurately and give some valuable suggestions.

## MODEL

Traditional consumption functions generally take consumption as a function of disposable income. Its general form is $C = f(Y-T)$, when $C$ represents consumption, $Y$ represents national income, $T$ represents government revenue and $f$ represents function. Life cycle theory and permanent income theory make it possible to introduce asset as an important variable into a consumption function, because asset could provide a path which wealth effect works through.

$$C_t = \alpha_a a_R + \alpha_y y_L \quad 0 < \alpha_a, \alpha_y < 1 \qquad (1)$$

Dornbusch *et al.* (1997) provides a simple consumption function as (1) which includes the value of asset. $C_t$ represents the consumption in the $t$ period, when $a_R$ represents the actual wealth which includes stock, bond, real estate, savings and so on and $y_L$ represents permanent income level in life cycle.

$$C_t = \alpha_0 + \alpha_y y_t^d + \alpha_s a_t^s + \alpha_h a_t^h + \varepsilon_t^c \qquad (2)$$

In empirical studies, the researchers generally put both stock wealth and real estate wealth into consumption function in order to compare with each other, such as Case *et al.* (2003), Dvornak and Kohler (2003), etc. Ludwig

and Slok (2001) put forward a representative long-term consumption function as (2) which consists of income, equity and real estate. In the function (2), $C_t$ represents the consumption in the t period, $y_t^d$ represents the household disposable income in the t period and $a_t^s$ represents the stock wealth in the t period, when $a_t^h$ represents the real estate wealth in the t period and $\varepsilon_t^c$ represents the external shock to the consumption in the t period.

$$\log(C_{it}) = \alpha_0 + \alpha_1 \log(y_{it}) + \alpha_2 \log(hp_{it}) + \alpha_3 \log(L_{it}) \\ + \alpha_4 \log(hp_{it})*\log(L_{it}) + \alpha_5 R_{it} + \lambda_i + \varepsilon_{it} \quad (3)$$

In this study, an individual fixed effects model (3) is established on the basis of the model (1) and model (2). In the model (3), C represents consumption, y represents per capita income, hp represents real estate prices and L represents consumer credit, when R represents the overall level of interest rates and $\lambda$ represents individual fixed effect, with $\varepsilon$ being the random error. The period is represented by t, with i representing the cross-section.

Panel model has some advantages compared to time series model. On the one hand, it can overcome omitted variable problem. The other hand, it is better in overcoming the limit of short data. It is a very short time from the market-oriented reform in China's real estate market to today, when the factors which influence the consumption in China are numerous and very complex, due to China being in the process of institutional transformation. So, panel model will help to improve the accuracy of the estimation and to enhance the reliability of conclusions.

This paper studies real estate wealth effect. So, the model (3) does not include stock, futures and the other assets.

Theoretically, the per capita income is the most important factor influencing consumption. In the case of the propensity to consume being unchanged, when the per capita income is higher, the consumption is higher.

The level of interest rates in some extent reflects the opportunity cost of household consumption. In theory, the rise of interest rates causes the decline in the level of consumption. Therefore, the interest rate is added into the model (3).

In many studies, the real estate's market value is taken as an indicator of real estate wealth and in China the real estate's market value is commonly measured by the value of real estate transactions. But taking the real estate's market value as the real estate wealth indicator, the increase in the number of commercial real estate may mask the loss of real estate wealth caused by the decline of real estate's market price. Therefore, the paper measures the change of real estate wealth simply with the change of real estate prices.

Overall, real estate prices influence the consumption in two ways. On the one hand, when real estate wealth changes, supposing the marginal propensity to consume being constant, the consumption based on own wealth changes. The other hand, when real estate wealth changes, the consumption based on credit changes, because the value of assets which can be used as mortgage changes. In Model (3), $\alpha_2$ reflects the impact of real estate prices on the consumption based on own wealth, while $\alpha_4$ reflects the impact of real estate prices on the consumption based on credit. With the financial system developing steadily, consumer credit is more and more important and the scale of credit influences the consumer more and more. Therefore, the model (3) includes the credit scale variable.

## DATA

In this study, the annual data in 1998-2011 of China's 30 provinces, municipalities and autonomous regions are used. Tibet, Hong Kong, Macao and Taiwan are not included.

Consumption is measured by the total retail sales of social consumer goods, when per capita income measured by per capita GDP.

The real estate prices are represented by the average commercial real estate sales price. Because the average commercial real estate sales price does not reflect the location and quality of real estate, it could underestimate the level of real estate prices to some extent. But it can meet the needs of the study well when the other real estate prices data are limited either in length or in the coverage.

In China, the central bank still provides the benchmark deposit and lending interest rates, when the other interest rates adjust generally along with individual one-year regular deposit and lending interest rates. Therefore, the level of interest rates is measured by the individual one-year regular deposit rate which is an annual month-weighted interest rate in this study.

Due to the lack of the provinces, municipalities and autonomous regions' consumer credit data, the paper measures the level of consumer credit with the balance of financial institutions' RMB loan in the end of every year. Although there could be a bit of error, but it is enough to meet the requirement of the study.

More of the raw data is from the CCER database and the real estate sales data is from the Statistical Yearbooks of the provinces, municipalities and autonomous regions. The interest rate is the level value and the other variables are logarithmic. With CPI measuring the price level and 1998 year being the base time, the impact of price change is excluded from all variables except interest rate.

Table 1 shows the descriptive statistics for the variables.

The test of data and model estimation is completed with Eviews7.2. In order to enhance the reliability of the test results, several unit root test methods are used.

Table 2 shows the results of unit root tests. The results show that log (c), log (y), log (hp), log (L) * log (hp) and log (L) are I (1) variables, while R is I (0) variable.

Several co-integration test methods are used to enhance test reliability and the co-integration test results are listed in Table 3.

The co-integration test results show that log(c), log(y), log(hp), log(L) and log(L)*log(hp) are co-integrated. The unit root test and co-integration test results show that the estimation of the model (3) is meaningful.

## ESTIMATION RESULTS AND ANALYSIS

Figure 1 is the scatter plot of the relation between per capita income and the consumption when the Fig. 2 is the scatter plot of the relation between real estate price and the consumption.

In the Fig. 1 and the Fig. 2, LOGC represents the logarithm of the consumption, with LOGY representing the logarithm of per capita income and LHP representing the logarithm of the real estate prices.

Intuitively, both per capita income and real estate prices are positively correlated with consumption.

Estimate model (3) with Panel LS. The estimation result is shown in the Table 4 and the coefficient of the intercept is not listed.

The results show that the per capita income is the most important factor which influences the consumption. The two variables are correlated with each other significantly and positively. When the per capita income increases by 1%, consumption increases by 0.782%, which is consistent with theoretical expectation.

The interest rate and the consumption are correlated with each other significantly and negatively. When the interest rate rises up one percentage point, the



Fig. 1: Per capita income and consumption

Table 1: Descriptive statistics of c, y, hp, R and L (common sample)

| Stats | c | y | hp | R | L |
|---|---|---|---|---|---|
| Mean | 2351.224 | 16313.66 | 2619.265 | 2.713 | 6628.775 |
| Median | 1654.489 | 12270.8 | 2004.87 | 2.291 | 4234.387 |
| Maximum | 16569 | 68300.19 | 14993.16 | 4.987 | 42691.31 |
| Minimum | 77.1 | 2364 | 744.125 | 1.98 | 291.44 |
| Std. Dev. | 2408.806 | 12717.31 | 1871.669 | 0.833 | 7003.549 |
| Skewness | 2.477 | 1.75 | 3.023 | 1.481 | 2.406 |
| Kurtosis | 10.978 | 6.084 | 14.913 | 4.382 | 9.808 |
| Jarque-Bera | 1543.776 | 381.126 | 3123.328 | 187.061 | 1216.712 |
| Probability | 0 | 0 | 0 | 0 | 0 |
| Observations | 420 | 420 | 420 | 420 | 420 |

In Table 1, c, y, hp, R and L are used in expressing China's 30 provinces, municipalities and autonomous regions' consumption, per capita income, real estate price, interest rate and consumer credit from 1998-2011
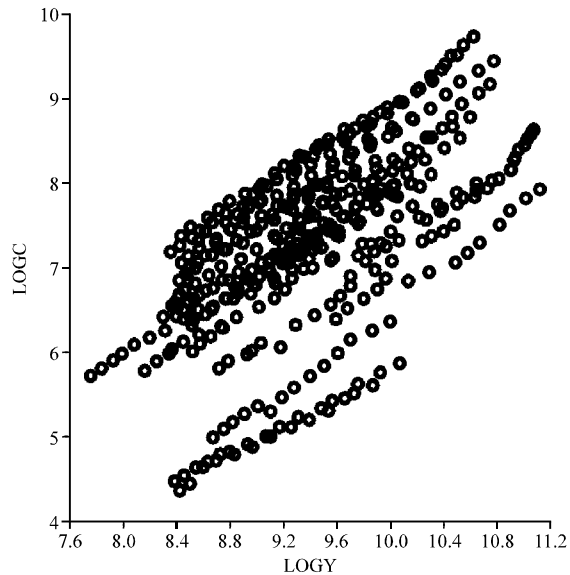
Table 2: Analysis of unit root test for the variables

| Variable | Method | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | LLC | | Breitung t-stat | | IPS | | ADF-Fisher Chi-square | | PP-Fisher Chi-square | | |
| | Stat. | Prob | Stat. | Prob. | Stat. | Prob. | Stat. | Prob. | Stat. | Prob. | T, I or N |
| log(c) | -4.077 | 0 | 3.512 | 0.999 | 1.201 | 0.885 | 54.227 | 0.685 | 75.356 | 0.087 | T I |
| log (y) | -3.865 | 0 | 4.627 | 1 | 1.569 | 0.941 | 42.975 | 0.952 | 88.662 | 0.009 | T I |
| log (hp) | -5.891 | 0 | 0.462 | 0.678 | -1.008 | 0.156 | 67.705 | 0.231 | 79.849 | 0.044 | T I |
| log (L) | -4.198 | 0 | 2.193 | 0.985 | 2.177 | 0.985 | 35.415 | 0.995 | 36.302 | 0.993 | T I |
| log (L)* log (hp) | -4.222 | 0 | 3.209 | 0.999 | 2.47 | 0.993 | 35.325 | 0.995 | 61.2 | 0.432 | T I |
| R | -15.534 | 0 | 2.11 | 0.982 | -10.598 | 0 | 202.277 | 0 | 603.966 | 0 | T I |
| d(log (c)) | -9.66 | 0 | -3.131 | 0 | -4.283 | 0 | 110.381 | 0 | 126.646 | 0 | T I |
| d (log (y)) | -10.849 | 0 | -4.415 | 0 | -4.677 | 0 | 114.265 | 0 | 153.875 | 0 | T I |
| d (log (hp)) | -13.669 | 0 | -6.636 | 0 | -8.723 | 0 | 176.286 | 0 | 263.979 | 0 | T I |
| d (log (L)) | -14.337 | 0 | -7.228 | 0 | -7.56 | 0 | 159.065 | 0 | 252.183 | 0 | T I |
| d(log (L)* log (hp)) | -14.665 | 0 | -5.801 | 0 | -8.563 | 0 | 177.372 | 0 | 354.276 | 0 | T I |

In Table 2, I indicate the test containing an intercept, T indicate containing trend, N indicate no trend and intercept, when log expressing logarithmic and d expressing difference. Unit root test is used in testing the stationarity of time series and it is also the basis for co-integration test preparation

Table 3: Results of co-integration tests

| | Null Hypothesis: No co-integration | | | |
| | Pedroni residual co-integration test | | | |
| | No weighted | | Weighted | |
| Method | Stat. | Prob. | Stat. | Prob. |
| **Alternative hypothesis: common AR coefs. (within-dimension)** | | | | |
| Panel v-Stat. | -3.036 | 0.998 | -2.836 | 0.997 |
| Panel rho-Stat. | 4.528 | 1 | 3.954 | 1 |
| Panel PP-Stat. | -0.781 | 0.217 | -4.538 | 0 |
| Panel ADF-Stat. | -4.128 | 0 | -5.926 | 0 |
| | | Statistic | | Prob. |
| **Alternative hypothesis: individual AR coefs. (between-dimension)** | | | | |
| Group rho-Statistic | | 6.452 | | 1 |
| Group PP-Statistic | | -5.852 | | 0 |
| Group ADF-Statistic | | -4.866 | | 0 |
| | | t-Statistic | | Prob. |
| **Kao Residual Co-integration Test** | | | | |
| ADF | | -5.878 | | 0 |

Co-integration tests containing intercept and automatic lag length selection based on SIC

Table 4: Estimation result of Model (3)

| | Dependent Variable: LOG(C) | | | |
| Variable | Coef. | Std. Error | t-Stat. | Prob. |
| **Method: Panel LS-Cross-section fixed (dummy variables)** | | | | |
| Log (y) | 0.782 | 0.045 | 17.092 | 0 |
| Log (hp) | -0.365 | 0.147 | -2.475 | 0.013 |
| Log (L) | -0.393 | 0.138 | -2.835 | 0.004 |
| Log (L)*log (hp) | 0.059 | 0.015 | 3.941 | 0 |
| R | -0.027 | 0.006 | -3.98 | 0 |
| R-squared | 0.989 | AIC | | -1.467 |
| Adjusted R-squared | 0.988 | Degrees of freedom | | 385 |
| F-statistic | 1067.085 | Prob.(F-statistic) | | 0 |



Fig. 2: Real estate price and consumption

consumption declines by 0.027%, which indicates the rise of the interest rates could lead the opportunity cost of the consumption to go up and then reduce the consumption. But the absolute impact of interest rates change on the consumption is very small, which indicates that the interest rate policy has less impact on the consumption. The reason could be that due to China's long-established policy of low interest rates, the interest rates signal is distorted and then has a weak effect on consumption.

The credit balance is correlated with the consumption negatively and significantly. When the credit balance increases by 1%, the consumption falls by 0.393%, which is not consistent with theoretical expectation. The reason could be that the most of the bank loan in China flows into the investment field, the consumer credit is very small and this paper uses the data of the total credit balance rather than the consumer credit balance. But with the fixed assets investment added into the model (3), the estimation result shows that the fixed assets investment is not significantly correlated with the consumption and the other variables are basically same as before, which indicates that the investment is not correlated with the consumption. So, it could be simply
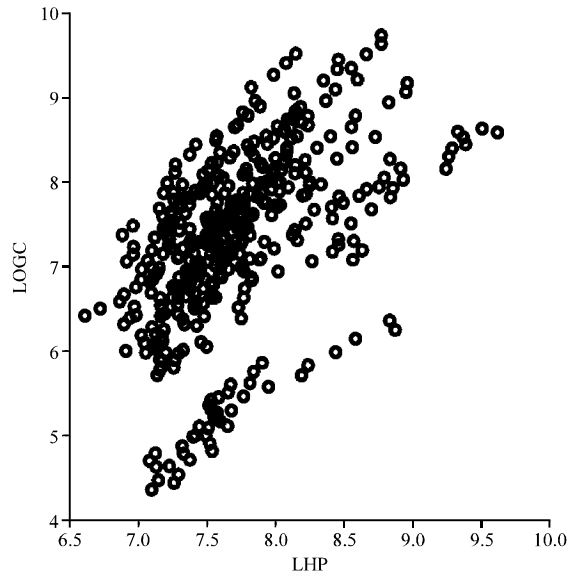
due to that the credit expansion alone could not have promoted the consumption in China. But why the coefficient is negative need more study.

The product term of the real estate prices and the credit balance is correlated with the consumption significantly and positively. The product term rises by 1%, the consumption rises by 0.059%. This indicates that, in 1998-2011, the change of the real estate prices could play a role in promoting the consumer credit by changing the value of the mortgage.

The item of the real estate prices measures the effect of the real estate prices' change on the consumption based on consumer's own wealth which real estate prices' rise will lead to increase. The real estate price is significantly correlated with the consumption and the coefficient is negative. When the real estate prices rise by 1%, the consumption falls by 0.365%, which is not consistent with the intuitive performance of Fig. 2. The reason could be that when the real estate prices rise, the residents save up more to prepare for the future real estate purchase and then reduce the consumption in the current period. Therefore, in 1998-2011, the real estate prices continuing to rise may also be an important reason for the consumption's share in GDP increasing slowly.

The above results are basically consistent with the research results of Elmendorf and Sheiner (1999) and Cheng and Fung (2008). The rise of the real estate prices promotes the consumption which is based on credit by increasing the value of collateral, while the rise of the real estate prices also leads to an increase in savings by increasing the cost of future real estate purchase and then suppresses the current consumption.

The total effect of rising real estate prices on the consumption in China is big, which is different from the research result of Skinner (1989). The total effect is also negative, which is different from the research results of Boone and Girouard (2002), Tang (2006), Dreger and Reimers (2004) and Leonard (2010). The reason for the difference could be China's special circumstances which is different from the developed countries.

Adjusted $R^2$ is 0.988, with AIC being-1.467, which indicates that the model (3) is fitted well.

From a realistic point of view, since the monetary reform of housing allocation in 1998, the local governments in China have taken the real estate industry as an important engine which drives the economic growth, when the other investment channels have mostly been blocked in a long time and per capita income have increased fast. Therefore, a lot of residents in China purchase real estate to promote living condition or to invest and then the real estate prices have been going up fast in general. In 1998-2011, the share of the consumption in GDP is always small, which many papers give a variety of explanations on. From the estimation results of this paper, it could be one important reason for low consumption that rising real estate prices lead to more current savings for the future housing purchase and then lead to a low level of current consumption. Therefore, in China's current economic situation, the unwavering and effective regulation on real estate prices could help to alleviate the pressure on residents' housing purchase and thus be good to the healthy growth of consumption.

## CONCLUSION

With China's 30 provinces, municipalities and autonomous regions' annual data in 1998-2011, the paper studies the relationship between the real estate price and the consumption using an individual fixed effects model. The empirical results show that the consumer's income is the most important factor to influence the consumption in China, which is consistent with theoretical expectations. The effect of real estate prices' change on the consumption consists of two aspects. One hand, because rising real estate prices lead to the increase in the value of assets that can be used for collateral, the consumer credit increases and then the consumption increases. On the other hand, due to rising real estate prices, the residents increase savings for future housing purchase and then the current consumption declines. In a total, the rise of real estate prices in China could lead to the decline of consumption. Therefore, it could help to ease the pressure on future housing purchase and thus be good to the healthy growth of the consumption to ensure that real estate prices reasonably grow.

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