

Theoretical and Empirical Analysis of the Impact of Real Estate Price Fluctuations on Household Consumption - Based on Provincial Panel Data in China

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Abstract: This thesis examines the impact of real estate price fluctuations on per capita household consumption in China through theoretical and empirical lenses. Utilizing provincial panel data encompassing 31 provinces, autonomous regions, and municipalities, it is found that increases in real estate prices generally boost per capita household consumption. However, a detailed analysis segmented by income and real estate price levels indicates that in regions with middle and high incomes, rising real estate prices are associated with a decrease in per capita household consumption, with more pronounced effects observed at higher income levels. Similarly, in areas where residential sales prices are at a medium to high level, although the initial price increase often increases per capita consumption, further increases can lead to a significant decline. The thesis also explores the relationship between different types of consumption expenditures and real estate prices, revealing that higher residential prices reduce per capita household expenditures on housing.

Keywords: Real Estate Prices; Household Consumption; Disposable Income

The real estate industry is a fundamental and leading sector in the national economy, with high interconnections with other industries. The development of the real estate sector directly or indirectly promotes the growth of related industries, playing a crucial role in driving China's economic expansion. Real estate prices can impact consumer behavior through three major mechanisms: the wealth effect, the mortgage credit effect, and the housing expenditure pressure effect (Black F, 1976). Household consumption is a vital factor for the sustainable development of China's economy,

making the study of the impact of real estate prices on household consumption of significant theoretical and practical importance. This paper investigates the effects of fluctuations in real estate prices on per capita household consumption in China through theoretical and empirical analysis, leading to research conclusions through quantification and mechanism analysis.

1. Theoretical Analysis

According to Milton Friedman's (1956) Permanent Income Hypothesis, a consumer's spending is not determined by his current income but by his permanent income. This hypothesis asserts that only permanent income influences consumption, and consumption is a stable function of permanent income.

$$C_t^E = k(i, w, u) \times Y_p \quad (1)$$

Here, the subscript t represents time, Y_p denotes permanent income, and C_t^E represents the actual consumption expenditure of consumers at time t . There is a fixed proportion k between actual consumption and permanent income, where k depends on the interest rate i , the ratio of property income to total permanent income is w , and u represents other non-income variables that affect the utility of money.

Per capita net consumption expenditure C_t^E for households is defined as the total per capita consumption expenditure C_t^T minus the investment in durable goods per capita plus the end-of-period income from durable goods per capita:

$$C_t^E = C_t^T - \Delta V_t^D + \frac{r}{2}(V_t^D + V_{t-1}^D) \quad (2)$$

$$C_t^E = C_t^T - (1 - \frac{r}{2})\Delta V_t^D + \frac{r}{2} V_{t-1}^D$$

In this context, the investment in durable consumer goods per capita by households is denoted by ΔV_t^D , and the end-of-period market value of durable consumer goods per capita is also represented by V_t^D . The arithmetic mean of the durable goods owned per capita by households is given by $\frac{1}{2}(V_t^D + V_{t-1}^D)$, which is

used to define the durable goods owned per capita by households for period t , with r representing the market return rate on durable goods.

This paper defines δ the depreciation rate of durable goods for the current period. Therefore, the market value of durable consumer goods at the end of period t is represented as follows:

$$V_t^D = (1-\theta\delta)C_t^D + (1-\delta)V_{t-1}^D \quad (3)$$

In this case, C_t^D represents the consumption of durable goods by consumers in period t . This paper assumes that the depreciation rate for durable goods purchased within the year is $\theta\delta$ ($0 < \theta < 1$), and the net end-of-year value is $(1-\theta\delta)C_t^D$. Following this, the net investment in durable goods is calculated as follows:

$$\Delta V_t^D = (1-\theta\delta)C_t^D - \delta V_{t-1}^D \quad (4)$$

Based on equation (2), the total per capita household consumption can be calculated as follows:

$$C_t^T = C_t^E + (1-\frac{r}{2})\Delta V_t^D - r V_{t-1}^D \quad (5)$$

The equation for C_t^T indicates that total per capita household expenditure equals per capita net consumption plus per capita net investment in durable goods (adjusted for in-period earnings) minus the initial earnings from durable goods. Since V_{t-1}^D is determined at the beginning of period t , equation 5 can only determine C_t^E and V_t^D .

If consumers increase their total assets due to normal savings, they will correspondingly increase their holdings of durable goods. According to the Permanent Income Hypothesis, when consumers receive transitory income Y_{Tt} , they generally do not increase their consumption expenditure but rather invest more in durable goods or increase their savings. The investment in durable consumer goods per capita by households, ΔV_t^D , can be expressed as follows:

$$\Delta V_t^D = (\Delta V_t^D)^e + \alpha_1(V_t^{D*} - (\Delta V_t^D)^e - V_{t-1}^D) + \alpha_2 Y_{Tt} + \alpha_3 (M_t - M_t^*) \quad (6)$$

Equation 6 includes variables that are commonly thought to influence the quantity of durable goods held. $(\Delta V_t^D)^e$ represents the expected change in durable goods, V_t^{D*} denotes the long-term demand for durable goods, and M_t^* represents the real demand for money. The expected change in durable goods, $(\Delta V_t^D)^e$, is driven by normal savings and is approximately proportional to permanent income:

$$(\Delta V_t^D)^e = \lambda Y_{Pt} \quad (7)$$

The long-term demand for durable goods is considered a function of permanent income $\frac{P_t}{P_{t-1}}$,

the relative prices of durable goods, and the long-term interest rate i_t ,

$$V_t^{D*} = \gamma_0 + \gamma_1 Y_{Pt} + \gamma_2 \frac{P_t}{P_{t-1}} + \gamma_3 i_t \quad (8)$$

The real money demand is considered to be a linear equation of permanent income, transitory income, and the long-term interest rate:

$$M_t^* = \eta_0 + \eta_1 Y_{Pt} + \eta_2 Y_{Tt} + \eta_3 i_t \quad (9)$$

By substituting equations (7), (8), and (9) into equation (6), the per capita household durable goods investment equation is obtained:

$$\Delta V_t^D = (\alpha_1 \gamma_0 - \alpha_3 \eta_0) + [(1-\alpha_1)\lambda + \alpha_1 \gamma_1 - \alpha_3 \eta_1] Y_{Pt} + (\alpha_2 - \alpha_3 \eta_2) Y_{Tt} + \alpha_3 M_t - \alpha_1 V_{t-1}^D + \alpha_1 \gamma_2 \frac{P_t}{P_{t-1}} + (\alpha_1 \gamma_3 - \alpha_3 \eta_3) i_t \quad (10)$$

Finally, by substituting equations (1) and (10) into equation (5), the consumer expenditure equation is derived:

$$C_t^T = (1 - \frac{r}{2})(\alpha_1 \gamma_0 - \alpha_3 \eta_0) + \{(1 - \frac{r}{2})[(1-\alpha_1)\lambda + \alpha_1 \gamma_1 - \alpha_3 \eta_1] + k\} Y_{Pt} + (1 - \frac{r}{2})(\alpha_2 - \alpha_3 \eta_2) Y_{Tt} + (1 - \frac{r}{2})\alpha_3 M_t + [(1 - \frac{r}{2})\alpha_1 - r] + (1 - \frac{r}{2})\alpha_1 \gamma_2 \frac{P_t}{P_{t-1}} + (1 - \frac{r}{2})(\alpha_1 \gamma_3 - \alpha_3 \eta_3) i_t \quad (11)$$

Specifically, $C_t^T = \beta_0 + \beta_1 Y_{Pt} + \beta_2 Y_{Tt} + \beta_3 M_t + \beta_4 V_{t-1}^D + \beta_5 \frac{P_t}{P_{t-1}} + \beta_6 i_t$

where, $\beta_0 = (1 - \frac{r}{2})(\alpha_1 \gamma_0 - \alpha_3 \eta_0)$

$\beta_1 = (1 - \frac{r}{2})[(1-\alpha_1)\lambda + \alpha_1 \gamma_1 - \alpha_3 \eta_1] + k$

$\beta_2 = (1 - \frac{r}{2})(\alpha_2 - \alpha_3 \eta_2)$

$\beta_3 = (1 - \frac{r}{2})\alpha_3$

$\beta_4 = (1 - \frac{r}{2})\alpha_1 - r$

$\beta_5 = (1 - \frac{r}{2})\alpha_1 \gamma_2$

$\beta_6 = (1 - \frac{r}{2})(\alpha_1 \gamma_3 - \alpha_3 \eta_3)$

2. Empirical Analysis

2.1 Model Establishment

The econometric model examines the impact of real estate price fluctuations on household consumption. The dependent variable is per capita household consumption in each province, while the explanatory variable is real estate prices, and the control variable is per capita disposable income.

$$LNC_{it} = \alpha_i + \gamma_t + \beta_1 LNI_{it} + \beta_2 LNP_{it} + \mu_{it}$$

In this model, the subscript i represents the province, and t represents time; LNC_{it} is the logarithm of per capita consumer expenditure in province i during year t ; μ_i represents unobservable regional effects aimed at controlling for the fixed effects of provinces; γ_t represents unobservable time effects, which are

variables that do not vary across provinces and explain all time-related effects not included in the regression model; LNI_{it} is the logarithm of per capita disposable income in province i during year t ; LNP_{it} is the logarithm of the average real estate sales price in province i during year t ; μ_{it} is a random disturbance term, which is assumed to be independently and identically distributed. This study collects and organizes balanced panel data consisting of 341 observations across 31 provinces, autonomous

regions, and municipalities directly under the Central Government in China, gathered from the National Bureau of Statistics and related databases.

2.2 Empirical Results

Table 1 presents the estimation results of the two-way fixed effects model based on different real estate sales prices, where both provincial and time effects are controlled. The estimation results are as shown in Table 1.

Table 1. Estimation Results of the Two-Way Fixed Effects Model

Variable	Per Capita Household Consumption Expenditure			
	(1)	(2)	(3)	(4)
Log of per capita disposable income of urban households	1.277*** (0.0536132)	1.274*** (0.053714)	0.995*** (0.0504344)	1.224*** (0.0525888)
Average sales price of commodity housing in province i	0.0292 (0.019454)			
Average sales price of residential housing in province i		0.0316* (0.018613)		
Average sales price of office buildings in province i			0.0150** (0.0069147)	
Average sales price of commercial business premises in province i				0.0152 (0.013285)
Constant	-2.968*** (0.4731904)	-2.951*** (0.4715733)	-0.337 (0.4506562)	-2.389*** (0.4721235)
Provincial fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	341	341	333	340
Adjusted R^2	0.989	0.989	0.993	0.990
F-value	2666.8	2672.5	3950.8	2864.0

Note:

1. *, **, *** indicate significance at the 10%, 5%, and 1% statistical levels, respectively (the same below).
2. Below the parameter estimates are their standard deviations (the same below).
3. Hausman tests reject random effects; this paper uses two-way fixed effects estimation results for analysis.

Table 1 shows the empirical relationship between real estate prices and per capita household consumption expenditure. The dependent variable is per capita household consumption expenditure. As can be seen from Table 1, the adjusted R-squared values are very high, all exceeding 0.98, indicating a high degree of fit of the variables.

Columns 1-4 use different types of real estate sales prices at the provincial level. Columns 1 and 4 show that the variables did not pass the significance level test. From Column 2, it is known that when the residential sales prices in

the provinces increase by 1%, per capita household consumption increases by 3.16%, and the variable passes the test at the 10% significance level; from Column 3, it is known that when the prices of office buildings in the provinces increase by 1%, per capita household consumption increases by 1.5%, and the variable passes the test at the 5% significance level.

Through the housing wealth effect, when real estate prices rise, the increased wealth of homeowners stimulates current consumption, leading to an increase in consumption by property owners. The mortgage credit effect occurs when, after a rise in property prices, homeowners can mortgage their properties to obtain more loans, thereby increasing consumption. The home-buying expenditure pressure effect refers to those who are temporarily renting or potential homebuyers (Jonathan, 1961); the rise in property prices compels them to save more for down payments

to purchase homes, thus crowding out consumption. The increase in real estate sales prices leading to increased per capita household consumption indicates that the sum of the real estate wealth effect and the mortgage effect outweighs the home-buying expenditure pressure effect.

2.3 The Impact of Different Income Levels and Real Estate Sales Price Levels on Per Capita Household Consumption

Table 2. Empirical Results Based on Grouping by Different Income and Residential Price Levels

Variable	Per Capita Household Consumption Expenditure of Urban Residents					
	Grouped by Per Capita Disposable Income			Grouped by Residential Sales Prices		
	Low	Medium	High	Low	Medium	High
Log of per capita disposable income of urban households	1.396*** (0.119899)	1.610*** (0.1151409)	0.882*** (0.0734332)	1.316*** (0.1053731)	1.038*** (0.1253644)	0.876*** (0.0667277)
Average residential sales price in province i	0.0502 (0.0405779)	-0.00249 (0.0337108)	-0.0711** (0.0288336)	0.0453 (0.0375054)	-0.00844 (0.0353915)	-0.0412* (0.0242936)
Constant	-4.100*** (0.9387046)	-5.675*** (0.9780643)	1.384* (0.7827471)	-3.379*** (0.8665622)	-0.520 (1.0158)	1.189* (0.6898765)
Provincial fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114	113	114	114	113	114
Adjusted R ²	0.982	0.994	0.994	0.989	0.992	0.994
F-value	519.5	1464.2	1511.9	865.3	1220.5	1688.0

Table 2 reveals that in provinces with low income levels, an increase in housing prices leads to an increase in per capita consumption. However, in provinces with medium and high income levels, an increase in housing prices results in a decrease in per capita consumption, with the reduction becoming more significant as income levels rise. In provinces where housing sales prices are low, rising housing prices increase per capita consumption, but in provinces with medium and high housing sales prices, an increase in housing prices leads to a reduction in per capita consumption, with higher prices exacerbating the decrease.

This indicates that in provinces with low income levels, due to lower incomes and a smaller proportion of potential homebuyers, the pressure from housing expenditure is less significant. Thus, an increase in housing prices increases per capita consumption. Conversely, in provinces with higher income levels, where the proportion of potential homebuyers is larger, the pressure from housing expenditure is greater, exceeding the combined effects of housing wealth and mortgage availability, thereby reducing consumption. Moreover, as

Residential prices better reflect the relationship between house prices and household consumption behavior. This paper uses residential sales prices in various provinces to measure house prices and conducts a grouped analysis of the provinces. Provinces are divided into three groups of different sizes based on per capita disposable income and residential sales prices for empirical analysis. The empirical results are shown in the following table.

the income level increases, the proportion of potential homebuyers increases, leading to more pronounced reductions in consumption in higher-income provinces.

In provinces with low housing prices, as housing prices rise, the pressure on savings for down payments is smaller, and the pressure from housing expenditures is less significant, resulting in an increase in per capita consumption. In contrast, in provinces with higher income levels, as housing prices increase, the pressure on savings for down payments is greater, and the pressure from housing expenditures is more substantial, exceeding the combined effects of housing wealth and mortgage availability, thus reducing consumption. Additionally, as income levels increase, the pressure from saving for down payments and housing expenditures becomes more significant, leading to more pronounced reductions in consumption in higher-income provinces.

2.4 The Impact of Real Estate Prices on Different Types of Consumer Spending

Table 3. Empirical Results of the Impact of Real Estate Prices on Different Types of Consumer Spending

Category	Per Capita Total Household Consumption	Per Capita Household Food Consumption	Per Capita Household Clothing Consumption	Per Capita Household Housing Consumption
Log of Urban Household Disposable Income	1.274*** (0.053714)	0.863*** (0.0660236)	1.481*** (0.0994699)	0.845*** (0.1368567)
Average Residential Sales Price by Province	0.0316* (0.018613)	0.0446* (0.0228785)	0.0918*** (0.0344683)	-0.0887* (0.0474236)
Constant	-2.951*** (0.4715733)	-0.335 (0.5796438)	-7.558*** (0.8732803)	-0.469 (1.201512)
Province Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	341	341	341	341
Adjusted R ²	0.989	0.983	0.971	0.920
F-value	2672.5	1653.1	964.6	328.3

Note: The data on per capita household housing consumption expenditure does not include home purchases; it represents the ratio of the total rent paid in each province to the total population of the province (including homeowners).

From Table 3, it is evident that as residential prices increase, total household consumption, food consumption, and clothing consumption all rise. However, per capita housing consumption expenditure decreases. For every 1% increase in housing prices, per capita housing expenditure decreases by 8.87%. This occurs because as housing prices rise, corresponding rents also increase, prompting some individuals to reduce their rental expenses by cohabiting with family members or sharing accommodations with others. Additionally, the rise in rents causes some potential homebuyers to become homeowners, thus reducing per capita housing expenditure.

3. Main Research Conclusions

This study finds that rising real estate prices increase per capita household consumption, indicating that the combined effects of real estate wealth and mortgage availability exceed the pressure of homebuying expenditures. Through empirical analysis segmented by income levels and real estate price levels, this study observes that in provinces with low

income levels, an increase in housing prices boosts per capita consumption. In contrast, in provinces with medium and high income levels, an increase in housing prices reduces per capita consumption, with the reduction becoming more pronounced as income levels rise. Similarly, in provinces with low housing sales prices, an increase in housing prices enhances per capita consumption, whereas in provinces with medium and high housing sales prices, it reduces per capita consumption, with greater reductions as prices rise. Additionally, through empirical analysis of different types of consumer spending and real estate prices, this study confirms that an increase in housing prices boosts household total consumption, food consumption, and clothing consumption expenditures, but reduces per capita housing consumption expenditure.

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