

# **Does Household Mortgage Really Restrain Consumption? an Analysis Based on the Data of China Family Panel Studies in 2018**

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## **Abstract**

Study on household mortgage has profound significance to better understand the economics. This paper finds that the household mortgage plays a positive role on consumption by examining the data of CFPS in 2018. Using the model that introduces interaction term, we argue that the mortgage has an income-effect for the comparatively low interest rate. The empirical result also shows the income-effect is greater in the “initiative mortgage households”.

**JEL classification numbers:** G21, D12, D14.

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## **1. Introduction**

For there are great numbers of families in the world, whose behavior on investment and consumption cannot be standardized to measure, explaining the household's behavior is of great significance and a challenge for economic theory. But with the help of the large data surveys and the statistical software, scholars could, much easier than before, summarize the law of household behavior and demonstrated the correctness of the economic models. It does really help us to understand the mechanism of economic better.

For China's economy, research on this topic are particularly meaningful. On the one hand, consumption is the most important means to promote economic growth, especially recent years. From 2001 to 2010, the average level of consumption contribution toward economic growth is 48.4% in China. But from 2014 to 2019, it reaches to 60.5%.

On the other hand, a prosperity of the household-loan never seen before appeared in the recent years. As the table 1 shows, the household-loan grows much faster than the Loans to Non-financial Enterprises and Government Departments & Organizations, and gradually dominate the growth of the total loans. The proportion of household-loan is only 15% in 2004, but it grows to 36%, more than twice, in 2019.

To sum up, both the household consumption and the household loans grow rapidly. However, according to the theory of economic, if a family borrow money from others at the time  $T$  and must repay the loan at the time  $T+1$ , it should consume less at the time  $T+1$ . So, how to explain the phenomenon of two-high-speed-growth? The answer could be that the families with house-loan would get benefit to increase their consumption.

The rest of this paper proceeds as follows. Section 2 describes how this paper relates to existing papers. Section 3 shows the data and variables construction. Section 4 presents the results of both baseline estimation and the robust test. Section 5 concludes.

## **2. Literature Review**

What determines the consumption? Most economists believe that the answer is the family income. In the early stage, Keynes (1936) presents the Absolute Income Hypothesis, and J.S. Duesenberry (1949) puts forward Relative Income Hypothesis, and F. Modigliani (1954) brings up his Life Cycle Hypothesis focusing on household asset in the all life time, and M. Fridman (1957) propounds a theory of Permanent Income Hypothesis. All these hypotheses focus on the family income. To some extent, it is right.

However, with the advent of the Rational Expectations Revolution, the theory of consumption develops greatly. Hall (1978) believes that consumption could not be expected and is stochastic in the most of time. Zeldes (1989) proves that, due to the borrowing constrains, household consumption must be smaller than the wealth owned by an expected consumption utility function. His paper also brings the topic that whether a family would consume more if they can borrow money from financial institutions or other families. With the assistance of econometric, some empirical papers demonstrate that household-loan and consumption are positively related by empirical data (Ludvigson, 1999). Hurst & Stafford (2004) also present the idea that refinance from mortgage could help household to produce a consumption stimulus of billions of dollars in US during the 1991-1994. Di Maggio, et al. (2017) find that a decline in adjustable-rate mortgages rate can induce a significant increase in household consumption during the period 2005-2007.

Turn to the literature focusing Chinese families, most scholars are conscious that consumption, to a great extent, is influenced by family income, but also influenced by other factors, for example, the wealth. Analyzing the micro data of CHFS (China Household Finance Survey) in 2011, Zhang & Cao (2012) and Liu, Zhang, & Lei (2016), prove that the family income, the housing wealth, and the financial wealth play a positive and significant impact on household consumption.

However, some scholars have found the opposite conclusions. Li & Chen's (2014) research presents that the household housing asset show no wealth-effect for stimulating consumption at all by analyzing the data of the Survey of China Urban Family in 2008-2009, and Zhao & Zhu (2017) even find micro evidence that household mortgage greatly suppresses consumption by analyzing the nationwide Survey of Consumer Finance data in 2010-2011.

To sum up, there is a controversy over the role of the mortgage, and it is necessary to do a comprehensive research. In addition, the empirical literature on the Chinese household consumption and the mortgage is deficient. This paper could contribute to the prior studies.

### 3. Sample selection and summary statistics

#### 3.1 Sample selection

The sample includes more than 10 thousand families in China, and the data is selected from CFPS (China Family Panel Studies) in 2018. CFPS, started from 2008, is implemented four waves of full follow-up surveys in 2012, 2014, 2016, and 2018 by Peking University. The original CFPS2018 data includes 14,241 families, covering 25 provinces in China and representing 95% of the Chinese population, and 298 variables, including family members, locations, income, consumptions, house rent, wealth, etc. We download the data from the website of Institute of Social Science Survey, Peking University.

#### 3.2 Variable measurement

The dependent variable in our paper is the Family Consumption Expenditure (*FCE*), which includes expenditure in the Household equipment and Daily necessities, the Dress, the Education and the Entertainment, the Food, the Rent of houses, the Medical care, the Traffic and Communication, and the others. Using the data of 2018 CFPS, this study sums up the following 8 items of expenditure as *FCE*, and they are the expenditure in food, cloth, furnish, daily necessities, house (rent, property fee and the heating fee), communication, medical care, and the others. This study includes 5 independent variables. They are presented as following:

1. Household Mortgage (*HM*) includes only one variable “the Mortgage”.
2. Family Income (*FI*). It is the sum of the salary, the business income, the transferred income (from government or others freely), the property income and the others. The *FI* in this paper includes 5 variables in CFPS2018, and they are the Wage or Salary, the Profit (for families operating business), the Transferred money (offered by relatives, friends, or government), the Property income (such as rental, interest), and the others.
3. Family Non-Consumption Expenditure (*FNCE*) includes both transfer payment and welfare payment for others, such as donation.
4. Family wealth (*FW*) includes the value of the land and the house after deducting principal and interest of mortgage, the value of the fixed assets, and the value of the financial assets and durable consumer goods. Of course, the debt must be deducted. In this paper, *FW* includes 12 variables in CFSP2018, and the formula to calculated *FW* is:

$FW =$  the market price of real estate + the market price of other real estate + the total value of the durable consumer goods + the total value of agricultural machinery + the cash and deposit + the total value of financial products - the principal and interest of the mortgage to be repaid - the loan of house decoration - the other loan from bank to be repaid - the loan from relatives and friends to be repaid - the private loan to be repaid + outstanding loans.

5. The other independent variables. There are, the number of family members (*FN*) and the location (*Urban*). *Urban* is a dummy variable which means it equals one if the family is urban family and zero otherwise.

Both the dependent variable and the independent variables are presented the values of the last 12 months. To make our sample more reliable, we delete the singularity and the unreasonable data. For example, any families whose *FCE* is less than or equal zero, and whose *FI* or *HM* is less than zero, and whose *HM* is greater than 2 million, are excluded. After that, our sample include 14,217 families.

Finally, except the *FN* and the *Urban*, the other variables are logarithmically treated.

### 3.3 Regression model setup

Based on the variables described above, the regression model can be set as following:

$$\begin{aligned} \ln FCE_i = & \alpha_0 + \alpha_1 \ln HM_i + \alpha_2 \ln FI_i + \alpha_3 \ln FNCE_i + \alpha_4 \ln FW_i \\ & + \alpha_5 FN_i + \alpha_6 Urban_i + \mu_i \end{aligned} \quad (1)$$

The logarithm of household mortgage (*LnHM*) is the key independent variable of equation (1). If mortgage restrains household consumption, the coefficient  $\alpha_1$  should be significantly negative. Otherwise, if mortgage stimulate consumption,  $\alpha_1$  should be significantly positive.

### 3.4 Summary statistics

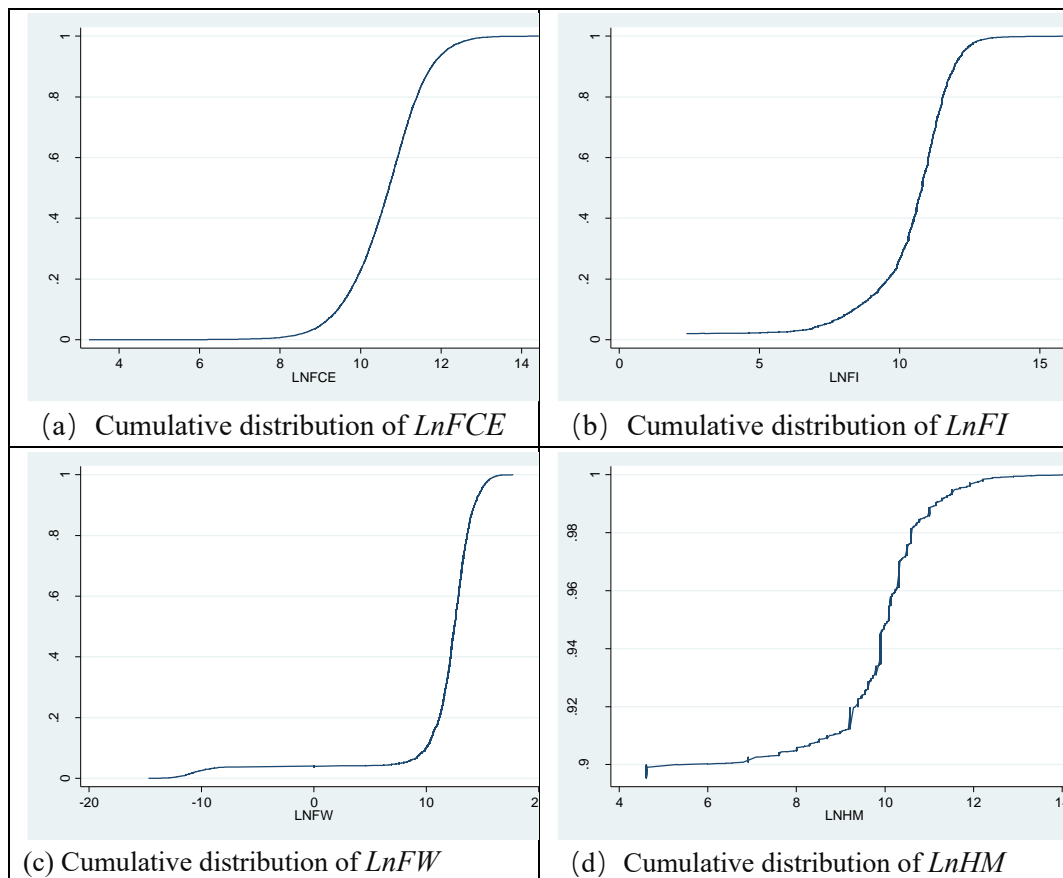
Table 2 presents summary statistics for variables used in this paper. The average of the logarithm of family consumption expenditure (*LnFCE*) is about 10.6, with a maximum value of 14.4 and a minimum value of 3.3. The mean of the logarithm of household mortgage (*LnHM*) is 1.0 and the minimum value is 0, indicating that many families have no mortgage. The mean of the logarithm of family income (*LnFI*) is about 10.3, which is slightly smaller than *LnFCE*, and the variance is 2.0, which is much greater than the variance of *LnFCE*. The mean of logarithm family non-consumption expenditure (*LnFNCE*) is 7.8, with a minimum value of zero. The mean of the logarithm of family wealth (*LnFW*) is 11.6, and the variance is 4.7, the greatest in the all 7 variables, indicating that the gap between the rich and the poor in China. The average family population is 2.9, which refers to “a family of three”. The mean value of the *Urban* is 0.51, indicating that the urban population and the rural population are nearly equal in the sample and our sample is of good representativeness.

**Table 2: Summary Statistics (CFPS2018)**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>Min</b>	<b>Max</b>
$LnFCE_i$	14,217	10.6432	0.9442	3.2581	14.4206
$LnHM_i$	14,217	1.0211	3.0251	0	14.1520
$LnFI_i$	14,217	10.3468	2.0059	0	16.0302
$LnFNCE_i$	14,217	7.7917	2.7178	0	13.3535
$LnFW_i$	14,217	11.5723	4.7116	-14.7197	17.7308
$FN_i$	14,217	2.9402	2.1678	0	21
$Urban_i$	14,217	0.5090	0.4999	0	1

*Note:* Except the  $FN_i$  and the  $Urban_i$ , the other variables are logarithmically treated, which means  $x = \ln(X + 1)$ . And if the  $FW_i < 0$ , then  $LnFW_i = \ln(-FW_i - 1)$

This table reports summary statistics for main observations on this paper's sample, including both the dependent and the independent variables, of CFPS2018. Figure 1 displays the cumulative distribution of the main variables. On the whole, the cumulative distribution curves of the  $LnFCE$ , the  $LnFI$  and the  $LnFW$  are relatively similar, but the "slope" of  $LnFCE$  is less than  $LnFI$  and obviously less than  $LnFW$ , which means that consumer expenditure has a certain "rigidity": even low-income families must have some consumption expenditure. And  $LnHM$  of the cumulative distribution curve shows that the families with jumbo housing loans are in the minority, and about 10% of families have a housing mortgage.



**Figure 1: Cumulative distribution of main variables (CFPS2018)**

## 4. Empirical results

### 4.1 Preliminary regressions and results

In this paper, OLS estimation method is adopted, and different types of variables are used for regression step by step. The representative regression results are summarized in table 3. Model 1 is the benchmark according to the Keynes's (1936) hypothesis.

Firstly, through model 2 to model 4, we can find that the coefficient of house mortgage ( $LnHM$ ) is positive at 1% significance level. These results indicate that the house mortgage in fact promotes household consumption. It indicates that house mortgage can ease household's liquidity constraint and reduce cash expenditure of purchasing real estate in current period, and extend cash outflow within a relatively long period, and therefore stimulate household's consumption in current period.

Table 3 also shows that no matter which model we use, the coefficient of the  $LnFI$  is positive and significant, which means the more money family earn, the more family would consume. The model 2 and 3 shows the coefficients of the  $LnFCE$ , the  $LnHM$  and the  $LnFW$  are positive and significant, and the coefficient of the

$LnHM$  is the middle among the three. And model 4 shows that the coefficient of  $Urban$  is positive and significant, which means the urban households spend more money than the suburb ones. All these coefficients are consistent with economic facts.

**Table 3: OLS regression estimates for preliminary regressions (CFPS2018)**

Independent variables	$LnFCE_i$	$LnFCE_i$	$LnFCE_i$	$LnFCE_i$
	Model 1	Model 2	Model 3	Model 4
$LnHM_i$		0.0524*** (11.78)	0.0429*** (19.26)	0.0383*** (17.60)
$LnFI_i$	0.1994*** (55.76)	0.1874*** (52.70)	0.1412*** (40.21)	0.1225*** (35.14)
$LnFNCE_i$			0.1000*** (38.96)	0.0971*** (38.74)
$LnFW_i$			0.0232*** (16.19)	0.0179*** (12.68)
$FN_i$				0.0482*** (15.97)
$Urban_i$				0.3283*** (24.20)
Constant	8.5899*** (227.64)	8.6502*** (232.61)	8.0910*** (215.04)	8.0633*** (217.47)
$R^2 / \overline{R^2}$	0.1795/0.1794	0.2070/0.2069	0.2999/0.2997	0.3355/0.3353
F	3109.57	1855.58	1522.03	1195.95

Notes: Significance at 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, \*, respectively. T-test value is reported in parentheses.

#### 4.2 Research on the subsample of urban households

To make the results more reliable, the author further analyzes the subsample of urban households by statistical analysis and the OLS regression of model, and the main empirical results were shown in table 4 and table 5.

Summary statistics of table 4 show that except the family population ( $FN$ ), the average of the other 5 variables ( $FCE$ ,  $FI$ ,  $FNCE$ ,  $HM$  and  $FW$ ) are much greater than the full sample, which shows there is a gap between the urban and suburb areas in China.

The OLS empirical results presented in table 5 show that no matter which model is used, the coefficients of the household mortgage ( $LnHM$ ) is still positive at 1% significance level. Other four independent variables also consistent with regression results in table 3. Therefore, we proved that the mortgage does make a positive effect on household expenditure in the urban families. Generally, the empirical results of subsample are not much different from the results of full sample.



**Table 4: Summary Statistics (CFPS2018 Urban households)**

Variables	N	Mean	S.D.	Min	Max
$LnHM_i$	7,237	1.3496	3.4565	0	13.9978
$LnFCE_i$	7,237	10.9017	0.8887	3.2581	14.1303
$LnFI_i$	7,237	10.7724	1.8954	0	16.0302
$LnFNCE_i$	7,237	8.0471	2.7202	0	13.0013
$LnFW_i$	7,237	12.5201	3.7694	-13.8971	17.7286
$FN_i$	7,237	2.7487	1.9661	0	17

**Table 5: OLS regression estimates for subsample regressions (CFPS2018 Urban households)**

Independent variables	$LnFCE_i$	$LnFCE_i$	$LnFCE_i$	$LnFCE_i$
	Model 1	Model 2	Model 3	Model 4
$LnHM_i$		0.0460*** (16.92)	0.0375*** (14.62)	0.0366*** (14.34)
$LnFI_i$	0.1985*** (39.76)	0.1853*** (37.37)	0.1396*** (28.66)	0.1364*** (28.10)
$LnFNCE_i$			0.0940*** (27.90)	0.0928*** (27.70)
$LnFW_i$			0.0295*** (12.50)	0.0300*** (12.79)
$FN_i$				0.0404*** (9.14)
Constant	8.7629*** (160.43)	8.8430*** (164.42)	8.2225*** (148.21)	8.1493*** (146.19)
$R^2 / \overline{R^2}$	0.1793/0.1792	0.2106/0.2103	0.3070/0.3066	0.3149/0.3145
F	1580.78	964.75	801.01	664.83

Notes: Significance at 1%, 5%, and 10% level is indicated by \*\*\*, \*\*, \*, respectively. T-test value is reported in parentheses.

### 4.3 Robust test

From 4.1 to 4.2 this paper proves that the coefficients of the *FI*, the *FNCE*, the *FW*, the *HM*, and the *FN* are positive and significant. What surprised us is that the *FM* plays a positive role on the *FCE*. The answer may be that the mortgage not only has a “crowding out effect” but also an “income effect” on *FCE*. In 4.3, we are going to prove the income effect of mortgages.

First, as the interest rate of the housing mortgages is much lower than the other types of loans, some families are intended to get mortgages if possible. Therefore, households, besides the rich, would still borrow money from commercial bank when purchasing a department or house. Even their funds become adequate after that, they will not reconsider paying it off early. We call this type of households “initiative mortgage family” and introduce a dummy variable: *getloan*, which equals one while the family is initiative mortgage family and zero otherwise. That is,

$$getloan_i = \begin{cases} 1, & \text{when } FA_i \geq AHM_i \\ 0, & \text{others} \end{cases}$$

*FA* stands for the high liquidity financial asset which household hold. In our study, it includes the cash and deposit, and the financial products. *AHM* stands for the both the principal and the interest of the mortgage the families should pay in the future. Second, we want to prove that mortgages have an income effect on consumption. So we introduce the interaction term of household mortgage and income variables for the initiative mortgage family:  $LnHM\_LnFI\_g_i = LnHM_i \times LnFI_i \times getloan_i$ , standing for the effect of *LnHM* plus *LnFI* of the initiative mortgage family for consumption .

Therefore, the model is improved to,

$$\begin{aligned}
 LnFCE_i = & \alpha_0 + \alpha_1 LnHM_i + \alpha_2 LnFI_i + \alpha_3 LnFNCE_i + \alpha_4 LnFW_i \\
 & + \alpha_5 FN_i + \alpha_6 Urban_i + \alpha_7 LnHM - LnFI_i - g + \mu_i
 \end{aligned}
 \tag{2}$$

We still use the data of CFPS in 2018 in 4.1. Table 6 provides summary statistics of the new two variables. From the table 6, it is reports only 1.1% of households held more liquid financial assets than they had to repay for their mortgages.

**Table 6: Summary Statistics for the two new variables (CFPS2018)**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>S.D.</b>	<b>Min</b>	<b>Max</b>
<i>getloan<sub>i</sub></i>	14,217	0.0113	0.1055	0	1
<i>LnHM - LnFI - g<sub>i</sub></i>	14,217	1.2475	12.3573	0	184.488

In this paper, the equation (2) was estimated by using OLS, and the results are shown in table 7. All the coefficient estimates of variables are significant, and the symbol of the original 6 variables are not changed. The coefficient estimates of the *LnHM - LnFI - g<sub>i</sub>* is 0.0013, positive and significant, which shows that the income effect of mortgage is greater in the initiative mortgage families. This is the result what we prove.

**Table 7: OLS regression estimates for robust regressions (CFPS2018)**

<b>Variables</b>	<b>Coefficient</b>	<b>Std. Err</b>	<b>T-test</b>	<b>P&gt; t </b>	<b>95% Conf. Interval</b>
<i>LnHM<sub>i</sub></i>	0.0368	0.0023	16.16	0.000	(0.0323, 0.0413)
<i>LnFI<sub>i</sub></i>	0.1223	0.0035	35.07	0.000	(0.1155, 0.1291)
<i>LnFNCE<sub>i</sub></i>	0.0970	0.0025	38.72	0.000	(0.0921, 0.1019)
<i>LnFW<sub>i</sub></i>	0.0178	0.0014	12.57	0.000	(0.0150, 0.0206)
<i>FN<sub>i</sub></i>	0.0482	0.0030	15.97	0.000	(0.0423, 0.0541)
<i>Urban<sub>i</sub></i>	0.3275	0.0136	24.14	0.000	(0.3009, 0.3541)
<i>LnHM _ LnFI _ g<sub>i</sub></i>	0.0013	0.0006	2.31	0.021	(0.0002,0.0024)
Constant	8.0680	0.0371	217.31	0.003	(7.9952, 8.1407)

Note:  $\overline{R^2} / \overline{R^2}$  are 0.3358/0.3355,  $F(9,10830)=1026.18$ .

## **5. Conclusion**

This paper may extend the existed empirical literature by examining the income effect of household mortgage. The main results are, First, Household mortgage can enlarge household consumption by income effect, and the effect is more obvious in “the initiative mortgage households”. The main reason is the interest rate of mortgage loans is lower than any other types of loans, which implicitly improves the income constrains of the families.

Second, the main factors affecting household consumption expenditure are still income. The influences of non-consumption expenditure, household wealth, and household population on household consumption expenditure are positive and significant. Meanwhile, the independent consumption expenditure of urban households is greater than that of the suburb households.

Our results reveal that the function of smoothing expenditures dominates in the interaction of household mortgage on household consumption. Household mortgage plays a more positive role in consumption stimulation than previous scholars’ impression. And these results show that consideration should be pay when making household mortgage policy.

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