Research on the Impact of Internet Consumer Credit on Hunan Residents’ Consumption Structure

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Abstract. The escalating market demand of local residents makes the consumption a booster of the growth of China’s economy. Mainstream consumers began to choose Internet credit as their daily tool for smoothing out consumption. The consumption structure has also changed with the development of the Internet credit. In order to explore how Internet credits changes the residents' consumption structure, this article selects the panel data of counties (districts) in Hunan Province from 2012 to 2018 for empirical research, uses the relevant indicators of Peking University Digital Inclusive Financial Index to construct Hunan Internet Consumer Credit Development Index, applies the fixed effect model (FE) and systematic GMM regression separately to analyse the impact of the Internet Consumer Credit on the consumption structure of residents, and then further compares the difference in the impact on different income levels. The results show that Internet consumer credit has promoted the upgrading of the consumption structure of residents in Hunan Province, and the improvement of the consumption structure of low-income residents is more significant.

1. Introduction and literature review

In recent years, with the continuous integration and innovation of Internet technology and consumer finance, Internet consumer credit has rapidly developed in the domestic market. Compared with traditional consumer finance, Internet consumer credit uses the advantages of platform, reaching online users to better improve the consumer experience and promote consumption upgrading of residents. The upgrading of the consumption structure of residents is the driving force behind economic growth during the period of economic transition. In order to promote the development of China's Internet consumer credit, the government issued the "Guiding Opinions on Actively Promoting the "Internet +" Action" in 2015, which mentioned the new goal of Internet consumer finance is to construct a new type of Internet-based economy in China. In response to the central policy, Hunan Province focused on the construction of Internet financial service platform and actively promote the development of Internet consumer finance. According to the data of Peking University's digital
financial research, in recent years, Hunan Internet consumer credit has significantly improved in terms of market scale, business coverage and penetration depth, demonstrating the huge development potential of the consumer market. In this context, how Internet consumer credit should reach its full potential to guide the consumption structure has become a new research focus in the field of consumer finance.

In 2012, the concept of the Internet finance was proposed. Many studies believe that the Internet finance has improved the existing financial model from three aspects: payment methods, information processing and resource allocation. Some scholars pointed out that the traditional consumer credit has the problems of substandard prices, high transaction costs, which can be improved in the Internet credit model. Compared the traditional consumer finance represented by credit cards of commercial bank, Internet consumer credit is more appealing for medium and low-income earners to alleviating credit constraints, and at the same time, it also controlled the risk of consumer default and even has more advantages in price competition[1]. Yi Xingjian (2018) found that the development of Internet consumer credit has significantly increased the consumption of low and middle-income families and residents in rural areas[2].

In the study of consumption structure based on the analysis framework of “survival-development-enjoyment”, research found that Internet consumer credit has an inhibit consumption on food and clothing and promotes cultural, educational and medical consumption significantly. Zhao Baoguo and Gai Nian(2020) found that Internet consumer finance significantly increased residents’ developmental consumption and promoted residents’ high-quality daily consumption and service[3]. Many studies verified the promotion effect of the development of Internet credit on the upgrading of consumption structure and some found that the impact on the consumption structure of urban residents was more significant.

To sum up, although existing research has focused on the impact of Internet credit on consumption, research of consumption structure in Hunan Province is still incomplete. In particular, the research of the impact on consumers with different income level during economic transition is still relatively new. This paper conducts empirical research based on the panel data of counties(districts) in Hunan Province from 2012 to 2018, constructs the Internet Consumer Credit Development Index of Hunan Province, then analyses its impact on the consumption structure, help to provide reference for the optimization of consumption structure and make suggestions for the balanced development of domestic Internet credit market.

2. Research design

2.1. Research hypothesis

The Internet consumer credit not only promotes consumption as a whole through liquidity constraints[4] and preventive savings motives[5], it has also changed residents' consuming behaviour in terms of consumer demand, consumer psychology, and consumption patterns.

The combination of electronic payment and Internet credit guides people to the specific scene, reduces the information search cost of both borrowers and lenders and breaks the regional limitations of offline financing. With the increase of credit-granting merchants and consumer platforms, the amount of consumer credit available to residents will become bigger. Psychologically, according to the "mental account" theory, the convenience of Internet credit makes consumers' psychological cash
accounts more sensitive and smoothly eases the psychological burden of residents[6]. On the other side, the emergence and dissemination of consumption hotspots on the Internet platform has a "demonstration effect", enabling consumers to follow the hotspots after the payment capacity is improved. In terms of consumer demand, the long-tail market of the Internet credit industry is significant. Many subdivided consumer finance markets have been opened. The internet credit caters to needs of many low-income groups who are excluded from traditional financial services. With the concept of debt-credit consumption being accepted on a wider scale, the high-quality consumption needs of low and middle-income groups have been further stimulated.

According to the analysis, this article proposes two hypotheses, H1: The current development of Internet consumer credit has a significant role in promoting the upgrading of the consumption structure of residents in Hunan Province; H2: Internet consumer credit has a more significant promotion effect on the upgrading of consumption structure of low-income residents comparing to high-income residents.

2.2. Index construction

2.2.1. Construction of Internet Consumer Credit Development Index.

In order to accurately evaluate the development of Internet consumer credit in Hunan Province, this article uses the relevant data of Hunan Province from the Peking University Digital Financial Index 2012-2018[7], then uses the entropy method to determine the index weights and construct Hunan Province 2012-2018 Internet Consumer Credit Development Index.

This section selects five main indicators includes the utilization degree of internet credit(the active user number of credit services per 10,000 platform users), the width of internet finance coverage, the depth of user participation and Internet payment. Those factors are the foundation for the development of Internet credit. They directly affect the efficiency and the scale of internet consumer credit development. With the increasing popularity of smartphone user, mobile payment will become the main too of Internet payment. Various Internet credit products are being designed and targeted at specific groups of people through the development of big data and cloud computing technology. Considering that information digitization is the technical support of Internet consumer credit, the level of digitization should be taken into account. Therefore, the Internet finance coverage of Hunan Province, the depth of Internet finance users' usage, the level of mobile and electronic payment, the degree of financial digitization, and the utilization level of Internet are the main indicators selected to construct the Hunan Internet Consumer Credit Development Index. Specific indicators are shown in Table 1.

| Table 1. Internet consumer credit indicators. |
|------------------------------------------------|
| Indicators | Coverage of Internet Finance | Depth of Internet User Usage Level | Electronic payment level | Utilization Level of Internet Credit | Level of Digitization |
|------------|--------------------------------|---------------------------------|--------------------------|-------------------------------------|-----------------------|
| Weight     | 0.201034                       | 0.200898                        | 0.197012                 | 0.197969                            | 0.203087                                   |
the data is processed using the range minimization method to non-dimensionalize.

**Positive indicators(a) and Negative indicators(b):**

\[ y_{ij} = \frac{x_{ij} - x_{j\text{min}}}{x_{j\text{max}} - x_{j\text{min}}} (a) \]

\[ y_{ij} = \frac{x_{j\text{max}} - x_{ij}}{x_{j\text{max}} - x_{j\text{min}}} (b) \]

In formula (1), \( x_{ij} \) represents the original data of the \( j \)-th in the \( i \)-th year. \( x_{j\text{max}}, x_{j\text{min}} \) respectively represents the maximum and minimum values of \( j \)-th index in the \( i \)-th year, \( y_{ij} \) are the data after converted into dimensionless, and the value range is \([0,1]\). Then use the entropy weighting method to measure the index weight. This method is an objective weighting method with high accuracy. The calculation steps follow:

\[ P_{ij} = y_{ij} / \sum_{i=1}^{m} y_{ij} \quad (a) \]

\[ H_{j} = -\left( \frac{1}{\ln m} \right) \sum_{i=1}^{m} P_{ij} \times \ln P_{ij} \quad (b) \]

\[ F_{j} = 1 - H_{j} \quad (c) \]

\[ W_{j} = F_{j} / \sum_{j=1}^{n} F_{j} \quad (d) \]

(2)

In formula (2), \( P_{ij} \) represents the numerical weight of \( j \)-th index in \( i \)-th year, \( H_{j} \) represents the entropy value of \( j \)th index, \( F_{j} \) is the difference coefficient of the \( j \)th index, and \( W_{j} \) is the weight of \( j \)th index. \( m \) is the time series span. The specific weight of each indicator is shown in Table1. The index weights obtained are used to generate the Internet consumer credit development index (ICD) shown in Figure 1. In 2012-2018, ICD increased steadily, and the growth rate slowed down in 2013-2014 and 2017-2018.

![Figure 1. Hunan Internet Consumer Credit Development Index(Source: Peking University Digital Financial Index 2012-2018)](image)

**2.2.2. Calculation of residents' consumption structure.**

The National Bureau of Statistics divides residents' consumption into eight categories, including food alcohol and tobacco, clothing, housing, daily necessities and services, transportation and communications, education and entertainment, medical care, other supplies and services. Information entropy was proposed by Shannon (1948) in the research of information economy. This article uses information entropy in the consumption structure of residents to obtain the proportion of each types of...
consumption in total consumption, and calculate the information entropy of residents to represent the consumption structure. The specific method is as follows:

\[ CS = -\sum k_i \ln k_i \quad k_i = c_i / C \quad (k \in (0,1)) \]  

(3)

c_i represents different types of consumption expenditure, C represents total consumption expenditure, and CS represents the complexity of consumption structure. The higher the CS value, the more obvious the upgrade of consumption structure, the lower value of CS indicates the simpler consumption structure.

2.3. Model setting and data source

The consumption structure (CS) is selected as the explained variable, and the Internet consumer credit development index (ICD) constructed above is used as the core explanatory variable. At the same time, household income (Inc) is introduced as the main explanatory variable that affects the household consumption structure according to consumption theory. Then this article selects social education level, urbanization level and economic development level as the control variables of the model. The basic empirical regression model is as follows:

\[ CS = \beta_0 + \beta_1\text{Inc} + \beta_2\text{ICD} + \beta_3K + \epsilon_i \]  

(4)

Inc represents the income level of residents, and K represents a set of control variables that affect the consumption structure of residents, including the level of social education, urbanization and economic development. The resident income level uses disposable income per capita of residents; the social education level uses the number of college students per 10,000 people; the urbanization level uses proportion of urban population in the total population; the economic development level uses per capita gross national product.

The data are derived from "Peking University Digital Financial Index 2012-2018", "Hunan Provincial Statistical Yearbook 2012-2018" and related data collected by the author. Due to the dimensional difference between the variables, this article uses logarithm processing to eliminate the heteroscedasticity between the variables.

| Table 2. Descriptive statistics of each variable. |
|------------------|------------------|------------------|------------------|------------------|------------------|
|               | Mean          | Stdev          | Median          | Maximum         | Minimum         |
| CS             | 1.3748        | 0.7370458      | 1.2987          | 2.0165          | 0.6626          |
| Inc            | 23520.61      | 10402.85       | 21876.77        | 54522.3         | 10164           |
| ICD            | 0.6328        | 0.3552         | 0.5344          | 0.9773          | 0.2256          |
| Urb            | 56.32         | 18.63651       | 53.77           | 100             | 35.05           |
| Edu            | 34490.25      | 20169.22       | 32678.49        | 90964           | 3144            |
| GDP            | 19663.619     | 40279.8        | 18512.78        | 223921          | 14163           |

Source: Compilation of relevant data in Hunan Statistical Yearbook

3. Empirical analysis

3.1. Overall regression analysis

In order to obtain robust and credible regression results, this paper uses the single fixed effects model (FE) in the static panel model and the system GMM model of the dynamic panel model to conduct an empirical analysis.
From FE regression results, we can see the development of the Internet Consumer Credit has a positive effect on consumption structure, and the coefficient has passed the 5% significance test. It shows that for every 1% development of the Internet Consumer Credit Index, the level of household consumption structure will increase by 0.11%. For every 1% increase in residents' income, the level of residents' consumption structure will increase by 0.66%. Among control variable, the level of social education and urbanization, and the level of economic development have a positive effect on the optimization of the consumption structure of residents.

Static panels can solve the problems of heterogeneity and endogeneity between individuals, but cannot eliminate the impact of lagged variables. According to Duesenberry's relative income theory[8], consumer behavior has a "ratcheting effect", so adding the lagged variable CS(-1) of consumption structure to the model can improve the accuracy of the regression results.

The GMM result of P value of AR(1) show that the difference of the disturbance term has first-order autocorrelation; the P value of AR(2) means there is no second-order autocorrelation in the difference of disturbance term, and there is no high-order autocorrelation in the test, so the model does not have autocorrelation problem. The Sargan test shows here is no over-identification problem for the instrumental variables of the system GMM. the influence coefficient of ICD on CS is 0.147, and it has passed the 10% confidence test, indicating that the development of the Internet Consumer Credit has a positive promotion effect on consumption structure., which verifies the research expectations. Residents’ income level and previous consumption structure also have a positive effect on the current resident’s consumption structure. The coefficient has passed the t-test at a significance level of 5%, proving the existing of “ratcheting effect” has continuous impact on in consumer behavior. Consumption structure is closely connected with residents' idea and habits, and it is difficult to change in a short time.

**Table 3. Overall regression result.**

| Model | Explained variable | Explaining variable | FE | SYS GMM |
|-------|--------------------|---------------------|----|---------|
|       |                    | lnCS                |    | lnCS    |
| Explained variable | lnCS | 0.438** | (4.720) |
| Explaining variable | lnInc | 0.659*** | 0.776** | (8.490) | (4.330) |
|                   | lnICD | 0.110** | 0.147* | (2.950) | (2.520) |
| Control variable | lnEdu | 0.012 | 0.042 | (0.130) | (0.370) |
|                   | lnUrb | 0.313 | 0.410* | (1.540) | (2.210) |
|                   | lnGDP | 0.056** | 0.306* | (3.500) | (2.730) |
| Constant term | c | -2.868** | -2.323* | (-3.240) | (-2.120) |
| R² | | 0.797 | | |
| F test | | 7.52*** | | |
3.2. Grouped (high and low income) regression analysis

In the previous section, through the overall regression of panel data in Hunan Province from 2012 to 2018, we found that the fixed effect model (FE) of static panel data and the systematic GMM method of dynamic panel data are effective for empirical research. In order to compare the difference impact on different income levels, this section refers to the practice of Gong Shien and Fan Cong (2012) [9] to divide overall sample into high-income group and low-income group by average number. The regression result using FE and systematic GMM method are shown in Table 4.

| Explained variable | High-income group | Low-income group |
|--------------------|------------------|------------------|
|                    | FE   | SYS GMM | FE    | SYS GMM |
| Explaining variable| lnCS(1) 0.148 (1.800) | 0.708* (2.320) |
|                    | lnInc 0.977** (3.370) | 1.259*** (8.490) |
|                    | lnICD 0.056 (2.180) | 0.011** (2.950) |
| Control variable   | lnEdu -0.011 (-0.060) | 0.025** (1.320) |
|                    | lnUrb -0.083 (-0.260) | 0.255 (0.390) |
|                    | lnGDP 0.023 (1.040) | 0.267** (2.750) |
| Constant term      | c    -2.173 (-0.850) | -0.861 (-3.240) |
|                    |      -2.868** (-3.240) | -3.110** (-2.850) |
|                    | R²   0.708 | 0.636 |
|                    | AR(1) 0.008 | 0.0043 |
|                    | AR(2) 0.590 | 0.1771 |
| Sargan test        | 0.555 | 0.199 |

From the regression results of high-income group in FE model, the t-test of main explanatory variable ICD is not significant and lacks validity. The regression coefficients of social education level and economic development level are negative, which is inconsistent with the actual situation and does not pass the economic significance test. In the system GMM model, the P value of the model AR(2) suggests the model does not have autocorrelation at the 5% significance level, and the Sargan test accepts the null hypothesis that all instrumental variables are valid at the 5% confidence level. The model does not have the problem of over-identification. In terms of coefficients of variables, CS(-1) had a positive effect on the CS. The coefficient of Inc on the consumption structure of the residents
was the largest, and it passed 10 % Significance level test. The ICD promotes the upgrading of residents' consumption structure, with coefficient of 0.01, and has passed the 5% significance level test. Among control variables, urbanization level, social education level and economic development level promote the upgrading of consumption structure, which accords with the economic meaning. From the regression results of the high-income group, the systematic GMM model with lagged variables better explain the residents' consumption structure.

From the regression results of low-income group, the regression coefficient of the main explanatory variable ICD is 0.011, Which shows that the development of Internet consumer credit improves consumption structure; Income is also the main factor that affects residents' consumption structure. The regression coefficients of social education level and economic development level are positive, which accords with practical situation. In the system GMM model, the P value of the model AR(2) suggests model does not have autocorrelation is accepted, and the Sargan test suggests that all instrumental variables are valid and the model does not have the problem of over-identification. The influence coefficient all pass the significance test. Specifically, the consumption structure of the residents in the last period has a positive effect on the consumption structure in the current period, which conform to actual economic situation; the increase in income level is the most Influencing factor to promote the upgrading of the consumption structure. The development of Internet consumer credit has a positive effect on the upgrading of residents' consumption structure, and the coefficient has passed the 5% significance level test; the regression coefficients of the social education level and economic development level are positive, which conforms to the economic significance test.

In general, GMM model is more explanatory to analyse the result. In the regression of the GMM model, the development of Internet consumer credit promotes the optimization of the consumption structure of both high-income residents and low-income residents, but the improvement of the consumption structure of low-income residents is more obvious, indicating that Internet credit has an impact on the long-tail market which can further stimulate the consumption motivation of low-income people. On the other hand, the income sensitivity coefficient of the low-income group is significantly higher, indicating that the current consumption low-income residents in Hunan Province is still limited by income level, and their willingness to consume has not been satisfied to a certain extent. It also reflects the large gap between income level and consumption demand in Hunan Province. The coefficient of CS(-1) in low-income groups is significantly larger than that of high-income groups which shows a more significant "ratchet effect". It means that consumers with low income levels still have relatively conservative consumption habits which limits the guiding effect of Internet consumer credit on the consumption structure. In control variables, the level of urbanization, economic development and social education have a positive effect on the consumption structure. And economic development and education have a significantly greater impact on the consumption structure of low-income residents than high-income residents.

4. Conclusions

Through the analysis of the panel data from 2012 to 2018, we found that the development of Internet consumer credit has a positive effect on the upgrading of the consumption structure in Hunan Province; in grouped GMM regression analysis, the result found that the Internet consumer credit has a more significant promotion effect on consumption structure in low-income residents than that of high-income residents. It suggests that low-income residents compared with high-income residents
have greater liquidity constraints, and Internet finance can provide online credit services for low-income residents who get rejected by traditional consumer finance institution. Especially for those emerging Internet users, Internet credit effectively smooths out immediate consumption and further stimulated their consumption motivation. People’s demand of high-quality product and service can be satisfied, and in this way can the internet platform really promote the upgrading of consumption structure.

According the research conclusions, this article proposes the following suggestions. First, improve the environment for consumer finance and narrow the income gap. Traditional financial development in rural areas of Hunan Province is relatively backward, and financial exclusion is still an unsolved problem. The unbalanced development of urban and rural areas hinders the release of residents' consumption potential. The large income gap has limited the consumer choice and attitude of low-income groups, Consumption structure still chronically stay the same if without proper guidance. In this regard, the government should increase investment in social security and inclusive finance, improve the overall income level of residents, and explore the consumption potential of low-income residents; secondly, improve the credit evaluation and authorization system to stimulate residents Credit demand. The credit system of Internet is not yet mature, still has high risk management costs and the coverage is not extensive enough. Financing institution should speed up the construction of the credit system and alleviate the phenomenon of credit rationing caused by asymmetric market information. At the same time, guide low and middle-income people to maintain a good credit record and train their risk management awareness through daily activities, so that residents can better understand and use consumer credit products correctly, thereby comprehensively promoting residents' demand for credit services; finally, enhance the innovation capacity of Internet consumer finance and guide the upgrading of residents' consumption structure. Through the development of consumer market and services in the past ten years, Hunan Province has become a relatively well-developed region in the middle part of China, provides local residents with various choice of many high-quality goods and services. Internet consumer credit should continue to use its scenario advantages to promote financial services and effectively improve the living standards of residents. At the same time, strengthen the innovation of design of financial products and services. The diversification of credit products can meet the demand of people with different income levels. High-income groups should be matched with high-quality and personalized credit services. For relatively low-income people, Internet consumer credit should continue to extend its services in the long-tail market, and serve more potential customers more efficiently at lower cost.

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