

Simulation and optimization of residents' consumption behavior change and consumption upgrading path under multi-factor conditions

Jing Li¹, 

¹ School of Economic, Shandong University, Jinan, Shandong, 250100, China

ABSTRACT

Increasing urbanization has led to large changes in residents' consumption behavior, but due to a variety of factors, the overall level of residents' consumption is low, so that it cannot play its role in promoting economic growth. This paper selects the panel data of China Household Finance Survey from 2011 to 2019, and empirically analyzes the impact and path of changes in residents' consumption behavior on consumption upgrading by constructing structural equation model and fixed effect model combined with STATA software. The study shows that changes in residents' consumption behavior and its dimensions can promote residents' consumption upgrading, and there is regional heterogeneity in the impact of changes in residents' consumption behavior on residents' consumption upgrading, and its promotion effect on residents' consumption upgrading is stronger in the developed regions in the Middle East. Based on the above findings, this paper puts forward feasible suggestions on how to optimize residents' consumption behavior to better promote residents' consumption upgrading.

Keywords: structural equation modeling, fixed effect model, consumption behavior, consumption upgrade, STATA software

1. Introduction

With the continuous development of the economy and the improvement of living standards, the consumer behavior is also changing. If consumption used to be just to satisfy the basic needs of life, now it has become more and more a way of life and cultural expression [1-4]. In this context, the changes in consumer shopping behavior will inevitably affect the operation and development of the entire consumer market, thus driving consumption upgrading [5-7].

One of the major signs of consumption upgrading is consumers' pursuit of higher quality consumption experience. With the improvement of consumers' living standards and the enhancement

 Corresponding author.

E-mail address: lijingsdu@hotmail.com (J. Li).

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of their economic strength, more and more people begin to pursue high-quality consumer goods and services [8-10]. In this process, consumers pay more and more attention to quality, brand and service, especially more favorable to high quality and high service goods and services. Another important sign is the rise of social consumption. With the rise of new social media platforms, social consumption has become a new trend in consumer life, people pay more attention to post-consumption online social networking through social networks, consumers can interact directly with brands and merchants to get more personalized services [11-14]. For merchants, it is important to seize this opportunity to improve the quality of goods and services in order to be invincible in the era of consumer upgrading [15-17].

Consumption, as one of the three engines driving economic development, plays a pivotal role in the national economy. Based on the influence framework of residents' consumption behavior and consumption upgrading, the article establishes the path model of residents' consumption behavior and consumption upgrading through SEM and constructs the regression econometric model of the influence model of consumption upgrading by combining with the multiple linear regression model. Then, the questionnaire of China's household finance survey from 2011 to 2019 is collected as a data source, and the specific influence of the changes in residents' consumption behavior on the path of consumption upgrading is analyzed through benchmark regression, robustness and heterogeneity tests in combination with the STATA software to provide a new theoretical support for the optimization of the path of consumption upgrading.

2. Theoretical foundations

Consumption is an important indicator of the quality of life of the population, and is a comprehensive reflection of the population's spending power and consumption preferences under certain conditions. At the same time, it is also an important indicator of the level of regional economic development. At present, China is in a critical period of transformation and upgrading, and high-quality economic development has become the new development mode. It is necessary to resolutely change the previous mode of high-speed growth, to realize the transformation of the development mode, the upgrading of the economic structure and the transformation of the development kinetic energy.

2.1. *Consumption behavior of the population*

Consumption structure is the result and embodiment of consumer activities, and it is due to the booming of the economic era that the changes in the form of the consumption structure of the population in the economic era are to a large extent accomplished by the Internet's direct influence on the behavioral patterns of consumer groups. Some scholars have proposed that consumer behavior is the activity formed by human beings when carrying out social consumption, which generally includes a series of behaviors such as selecting, comparing, and shopping for services. On this basis, some scholars Yin Shijie proposed that consumer social activity refers to the process of consumption accomplished by consumers through the purchase of goods or services at a certain level of income. From this, it can be seen that consumer behavior roughly covers two meanings, one is that the consumer is the foundation and center of consumer behavior, and any consumer behavior activity cannot be separated from the consumer. The second is that consumer behavior is a long-term process that includes pre-purchase, purchase and post-purchase. In addition, there are multiple influencing factors on consumer behavior, including individual and group consumption psychology, consumption object psychology, and social environmental factors, among which the value of consumers' own economic resources (including income, property, and credit, etc.) and the relative value of consumption objects (goods or services) are important components, which play a crucial role in consumers' own purchase decisions and consumer behaviors [18].

Consumption behavior of residents refers to a series of economic behaviors carried out by residents

in order to realize the consumption of their products or services. The rise in the level of residents' incomes has led to dramatic changes in their consumption levels. The consumption behavior of the residents is the fundamental cause affecting the entire national economy, social development and the people's own development. In their consumption behavior, residents prefer to buy more products through less price, and their consumption behavior is always coordinated with farmers' income, cultural quality, social environment, social status, life concepts and other factors, and most of the consumers' consumption behavior occurs within their affordability. Consumer behavior is often uncertain and subject to change at any given time among different groups of consumers.

2.2. Consumption upgrading of the population

Stimulate the innovative vitality of market players, promote economic development, and facilitate the transformation and upgrading of residents' consumption, with consumption upgrading mainly referring to the increase in the proportion of various categories of consumption expenditure at the level of the consumption structure. From the point of view of each family and individual, it is manifested in the quality of life, employment income, lifestyle, and the convenience of life, have been significantly improved. In terms of content, consumption upgrading mainly reflects the elevation of products with less elasticity of need to those with more elasticity of need. In terms of level, consumption upgrading mainly reflects the relationship between the increase in the proportion of expenditure on various categories of consumer goods; in other words, the proportion of food for the population has fallen and the proportion of non-food has risen, indicating that the quality of life of the population has continued to improve. It is mainly embodied in three aspects, firstly, the change from individualized consumption behavior to socialized consumption behavior, and the change from discrete consumption behavior to aggregated consumption behavior; secondly, the change from subsistence consumption behavior to service consumption behavior; and thirdly, the upgrade from self-sufficient consumption behavior to market-oriented consumption behavior [19].

Therefore, consumption upgrading can be attributed to upgrading the content and quality of consumption, and in the process of upgrading the content of consumption, the rate of service consumption will continue to increase. This includes consumers paying more attention to health care, releasing consumption through tourism, and focusing on education development. In the process of upgrading the quality of consumption, consumption upgrading is manifested in the pursuit of quality of food, a wider variety of choices, and a better dining environment, instead of the previous single purpose of eating enough. There has also been a drastic change in the housing conditions in the past, and people are no longer plagued by problems such as difficulties in treating illnesses, and they have more abundant financial capacity to plan for the future. Therefore, to improve the quality of residents' consumption is inseparable from the satisfaction of human needs, people's pursuit of a better life, then the level of residents' consumption, the consumption structure will change. To summarize, consumption upgrading refers to the change in the type of consumption of residents' households from survival-type consumption expenditure to development- and enjoyment-type consumption expenditure, which causes a decrease in the Engel coefficient of residents' households and an increase in the proportion of service-type consumption expenditure.

2.3. Impact Mechanisms Framework

Based on the consumption decision theory, this paper constructs a theoretical framework based on the existing life cycle hypothesis (consumers will rationally arrange consumption at each stage according to their lifetime income), precautionary savings hypothesis (to prevent future uncertainty, individuals are more inclined to reduce current consumption), and the liquidity constraint theory (due to reasons such as the capital market is not sound, individuals have difficulty in obtaining strong financial support, and they are inclined to reduce current consumption and increase savings). Theoretical framework, in-depth analysis of changes in residents' consumption behavior and

consumption upgrading influence path of the role of the mechanism. Its specific framework is shown in Figure 1, relying on the changes in the type of consumption behavior of residents under multi-factor conditions, effectively enhance the residents' consumption capacity, reorganize consumption confidence, better enrich the residents' consumption choices, access to promote the residents' consumption upgrade.

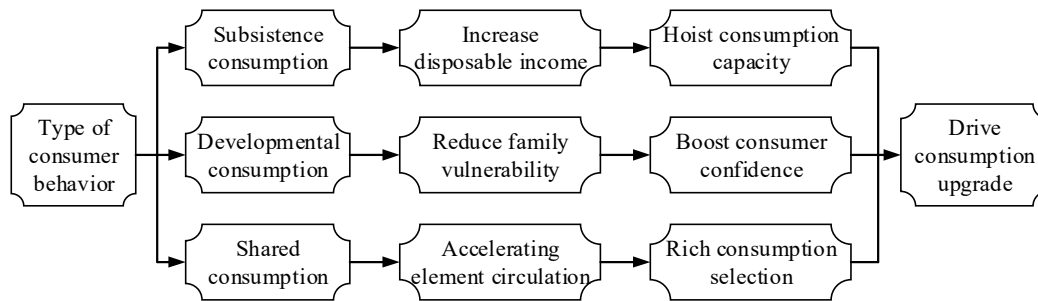


Fig. 1. The mechanism of consumer behavior impact mechanism

3. Research methodology

In recent years, people's living standards have continued to improve, and residents' consumption expenditures have gradually shifted from a food-based consumption structure to a diversified one, with a marked upgrading of the consumption structure. Consumption upgrading refers to the upgrading of the structure and level of various types of consumption expenditures in total consumption expenditures, and can reflect the consumption level of residents. One of the goals of the current work is to effectively expand consumption, improve consumption capacity, improve the consumption environment, so that residents can consume, willing to consume. Consumption, as an important part of the "troika" of economic growth, is of great significance in promoting economic development, expanding domestic demand and expanding the consumer market.

3.1. Research Modeling

3.1.1. Structural equation modeling. Structural Equation Modeling (SEM) is an effective method for assessing and testing complex causal relationships, which combines path analysis and factor analysis of variables, and can more accurately detect associations between multiple variables and the intrinsic composition of them, and can tolerate a certain amount of bias. SEM can classify variables into latent and measurable variables. SEM can classify variables into latent variables and measurable variables, and can classify them into endogenous and exogenous variables according to the generation perspective. Exogenous variables are independent variables and they can be influenced by external factors that affect the variables inherent in the system. Endogenous variables are not only affected by exogenous variables, but also by the interrelationships between the intrinsic variable factors [20].

SEM model is a tool that can deal with complex data, which organically combines the measurement model and the structural model in order to study the interrelationships between latent variables and measurable variables, and also reflects the interrelationships among the latent variables well.

The expression of the measurement equation is:

$$X = Ax\xi + \delta \quad (1)$$

$$Y = Ay\eta + \varepsilon \quad (2)$$

where, X is the exogenous measurable variable, Y is the endogenous measurable variable, Ax is the exogenous load factor, Ay is the endogenous load factor, ξ is the exogenous latent variable, η

is the endogenous latent variable, δ is the error term for the exogenous measurable variable X , and ε is the error term for the endogenous measurable variable Y .

The expression for the structural equations is:

$$\eta = B\eta + \Gamma\xi + \zeta \quad (3)$$

where B is the relationship between the endogenous latent variables, η is the endogenous latent variable, ξ is the exogenous latent variable, Γ is the path coefficient, and ζ is the residual term is the portion of the endogenous latent variable η that fails to be explained and the residual term ζ is uncorrelated with δ, ε, ξ .

3.1.2. Multiple linear regression. In multiple regression analysis, when the dependent variable y is interfered by external influences, these influences are defined as the independent variable x_i . If there is a certain correlation between y and x_i , a multiple regression model can be established based on the dependent variable y and each influence factor x_i [21]. The mathematical expression of the model is as follows:

$$y_1 = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \varepsilon_t \quad (4)$$

The multiple linear regression model is represented by a matrix:

$$y = x\beta + \varepsilon \quad (5)$$

The valuation $\hat{\beta}$ of β can be found from the least squares principle as:

$$\hat{\beta} = (x^T x)^{-1} x^T y \quad (6)$$

If the role and effect of a particular variable x_i on the dependent variable y is not very significant, the value of the coefficient β_j of the multiple regression model should be zero, and the test of whether the dependent variable x_i is significant or not is often can be verified by the following expression:

$$\frac{\beta_j^2 / C_{jj}}{S_{\text{EE}} / (n - p - 1)} - F(1, n - p - 1) \quad (7)$$

In the above equation, if independent variable x_i is significant for dependent variable y , it obeys a $F(1, n - p - 1)$ distribution.

If $|F| \geq F_{1-\alpha, p, n-p-1}$, the regression coefficient β_j is considered significant at a confidence interval of $1 - \alpha$.

Note that the regression model should be rebuilt for each deleted variable and each coefficient should be tested until all regression coefficients are significant.

3.1.3. Research modeling:

1) Structural equation model construction. Based on the influence mechanism of changes in residents' consumption behavior and the influence path of consumption upgrading under multi-factor conditions given in the previous section, this paper combines the SEM model to establish a research model as shown in Figure 2. It mainly includes exogenous variables residents' consumption behavior and residents' consumption upgrading, and residents' consumption behavior includes demographic characteristics, assets and liabilities, insurance and protection, expenditures and incomes, as well as financial literacy, grassroots governance and subjective evaluation. Potential variables of residents'

consumption upgrading include subsistence consumption, developmental consumption and enjoyment consumption.

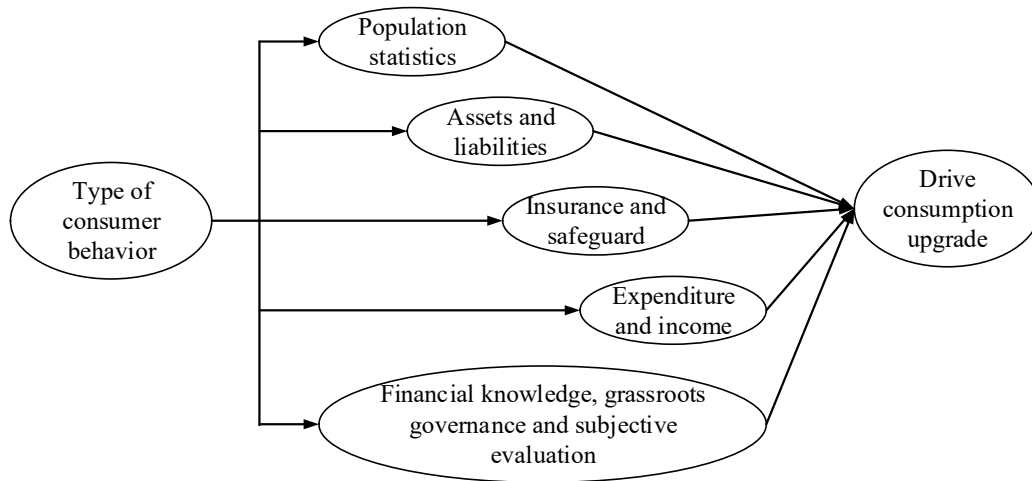


Fig. 2. Structural equation model construction

2) Multiple linear regression model construction. In order to examine the effect of changes in residents' consumption behavior on the path of consumption upgrading under multi-factor conditions, this section constructs the following baseline econometric model with a multiple linear regression model, namely:

$$CU_{it} = \beta_0 + \beta_1 CB_{it} + \beta_2 \sum Control_{it} + \varepsilon_{it} \quad (8)$$

where i denotes region, t denotes time, CU_{it} denotes the type of consumption upgrading of the population, CB_{it} denotes the consumption behavior of the population, $Control_{it}$ represents a set of control variables, ε_{it} is a random perturbation term, β_0 is the intercept term of the model, and $\beta_1 \sim \beta_2$ is the estimated coefficients of the core explanatory variables of interest in this paper. The control variables include gender (SEX), age (AGE), marital status (MAR), years of education (EDU), health status (HEAL), total household income (INCOME), household net worth (HNW), household size (SCALE), pending bank loan repayment (LB), pending repayment of loans by family, friends or private individuals (FFPL), whether or not they have made property investment (PI), GDP per capita (GDP), Provincial Marketization Index (PMI).

3.2. STATA statistical software

3.2.1. STATA software. STATA software is a statistical analysis software, not only powerful, but also has a very comprehensive Meta-system analysis, so it has been recognized by foreign magazines with high influence and recognition. STATA software is essentially an integrated statistical analysis software, which can provide charting, statistical analysis, and data management, so it is popularly used in biostatistics, economics, and sociology. Sociology.

Click on the STATA icon to log in to the STATA interface. The menu bar includes "File", "Edit", "Data", "Graphics", "Statistics", "User", "Windows", and "Help" (except for the general status bar, toolbar, and menu bar of the Win version of the software). The STATA run consists of four windows, namely the result window, the command window, the command review window, and the variable name window.

1) Result window. The upper right part of the interface is the result window, which mainly displays the software operation information such as error information, execution results and executed commands.

2) Command window. The lower right part of the result window is the command window, which is

similar to the command line, you need to execute the command here, enter to finish, the execution starts, and the result window will show the relevant results.

3) Command Review Window. The upper left of the interface that is the command review window, the window will list all the commands (have been executed), the implementation of a single-click operation can automatically copy the command to the command window. If there is a need to repeat the execution, just use the mouse to double-click on the relevant commands in the Review window to achieve the goal.

4) Variable Name Window. The lower left part of the interface is the Variable Name Window, which contains the names of various variables.

3.2.2. STATA operations. When you start STATA you will see a toolbar and four windows. The Command window is used to enter commands. The Review window displays the commands that have been entered. The Results window displays the results of running the program or command. The Variables window displays the names of all the variables in the dataset that are being used. The STATA commands can be typed into the Command window one by one. The command will be executed by typing in the Command window and hitting the enter key and the command is executed. The STATA command can be typed in the Command window line by line and the statement is executed by hitting Enter. The entered command can be saved as a .do file. Alternatively, by clicking the do-file editor button on the STATA toolbar, you can enter the program editor window, type commands in succession, and then click the do button on the toolbar to run the program and output the results of each step in the Results window (click the run button to run the program without outputting results). Save the program file before exiting.

4. Study design

Consumption is the ultimate goal of production and business activities, and only by expanding consumption can we effectively promote economic development. Since the reform and opening up, China's economy has experienced many major changes in the form of consumption. Consumption upgrading has effectively promoted the development of national economy and achieved good development results. At present, there is a certain lag in the construction of the consumption system, the creation of the consumption environment and the propaganda of the consumption ideology, and the residents are limited by their income, resulting in a low level of consumption. Rational allocation of consumption resources, the creation of a favorable consumption environment for residents, and the further upgrading of consumption can effectively promote high-quality economic development.

4.1. Research data sources

4.1.1. Research data selection. The data used in this part is based on the 2019 China Household Finance Survey database (CHFS2019), which will be merged in the empirical part of the wealth effect in the CHFS2017 and CHFS2015 databases. The sample of the CHFS2019 survey covers 29 provinces (autonomous regions and municipalities directly under the central government), 343 districts and counties, and 1,360 villages and neighborhood committees in China, and finally collected information on 34,643 households and 107,008 family members, which is highly geographically representative. This paper explores the influence path of residents' consumption behavior on consumption upgrading with the CHFS2019 cross-section data. According to existing studies, the larger the proportion of financial assets in total assets, the more households consume, so we quantify residents' consumption behavior in terms of the proportion of financial assets in total assets, and logarithmic total household consumption as the type of consumption upgrading dependent variable.

4.1.2. Questionnaire design. The “Part I: Basic Information of Family Members” in the CIEFR-HS-Questionnaire-2017 is a part shared by the China Center for Family Finance Survey and Research (CCFFS) and its partner organizations. The “Part II: Education of Family Members” is a cooperative survey data of China Institute of Education and Financial Science, Peking University and China Center for Family Finance Survey and Research, Southwestern University of Finance and Economics, with the ownership belonging to China Institute of Education and Financial Science, Peking University. This part of the questionnaire data is located in the “chfs2017_ind_202104” dataset in the “CHFS 2017 Survey Data” database. Table 1 shows the questionnaire designed based on the China Household Finance Survey (CHFS) questionnaire, combined with the research content of this paper. The questionnaire consists of six parts: demographic characteristics, assets and load, insurance and protection, expenditure and income, financial knowledge, grassroots governance and subjective evaluation, and types of consumption upgrade.

Table 1. Family financial survey family questionnaire

Dimension	Explanation	Code
Population statistics (PS)	Member basic information	PS1
	Member work information	PS2
	Member income information	PS3
Assets and liabilities (AL)	Non-financial assets	AL1
	Financial assets	AL2
	Other liabilities	AL3
Insurance and safeguard (IS)	Social security	IS1
	Commercial insurance	IS1
Expenditure and income (EI)	Consumer spending	EI1
	Transfer expenditure	EI2
	Transfer income	EI3
	Other expenditures and incomes	EI4
Financial knowledge, grassroots governance and subjective evaluation (FGS)	Financial knowledge	FGS1
	Environmental protection	FGS2
	Tax and government evaluation	FGS3
	Fertility condition	FGS4
	Crime encounter	FGS5
	Volunteer service	FGS5
Consumption upgrade type (CUT)	Subsistence consumption	CUT1
	Developmental consumption	CUT2
	Shared consumption	CUT3

The data used in this study come from the China Household Finance Survey (CHFS) organized and managed by the China Household Finance Survey and Research Center of Southwestern University of Finance and Economics and the China Education Finance Household Survey (CIEFR-HS) of Peking University.

4.2. Research data processing

4.2.1. Research data cleaning. After the data collection comes back, this study will do the preliminary processing of all the data, the main processing includes deleting invalid samples due to serious guessing and cheating by the visitors, deleting invalid variables, and deleting sensitive data. Correct duplicate sample numbers caused by human beings, and correct human misuse reported by the visitors actively. Merge tracking and new visit data, split household and individual data, split multiple choice. Add labels, add questionnaire type. Cleaning of notes and other options, interpolation of numerical questions and determination of related rules, etc.

After the initial processing the data is generated in a usable version. If extreme values or outliers are found again during the data use, this study conducts a second recording to verify the confirmation. If no recordings are made, a model is created to deal with the extreme values and outliers so that the data version is updated and the user is informed.

4.2.2. Research data storage. At the end of data cleaning, the generated data from the China Household Finance Survey are stored inside the following three datasets.

1) The dataset file name contains “hh”, which represents the data of the household part of the questionnaire, such as assets and liabilities, household expenditures and incomes, financial literacy, grass-roots governance, and subjective evaluation.

2) The file name of the dataset contains “ind”, which represents the data of the individual part of the questionnaire, such as demographic characteristics (part of the individual's work and income information, insurance and protection, education of family members, etc.).

3) The file name of the dataset contains “master”, which represents the regional data, including the information of the surveyed provinces and the weighting variables of each surveyed data.

In addition, the raw data should be in dta format and can be opened in STATA 13 or above.

5. Empirical analysis

The improvement of consumption quality is the main element of the improvement of the quality of life. As society continues to progress and the economy continues to develop, people's consumption level is gradually rising, and this rise is mainly reflected in the continuous optimization of the consumption structure. That is to say, the proportion of consumption used for means of subsistence has gradually decreased, while the proportion of consumption used for means of enjoyment and development has gradually increased. This increase has also raised the technological content of consumption, helping to promote the improvement of people's quality of life, satisfy people's growing spiritual needs, and fundamentally improve people's quality level, thereby boosting consumption and raising productivity levels.

5.1. Analysis of structural equations

5.1.1. Evaluation of model fit. The acquired sample data were imported into the SEM model constructed in the previous section, and the fitting results and goodness-of-fit results were obtained as shown in Figure 3 and Table 2, respectively. Based on the fitting results, it can be seen that the coefficient values of each path in the model are positive and significant, which indicates that the model constructed in this paper is estimated by fitting, i.e., there is no unacceptable value. This also indicates to a certain extent that the validation factor analysis effect is more significant, which can be used to analyze the impact of changes in residents' consumption behavior on the path of consumption upgrading under multifactor conditions.

Chi-square/df is the absolute fit index, indicating the explanatory ability of the overall model to fit the data, and the general recommended value is less than 3. The test result of Chi-square/df is 2.817, which is obviously less than 3, indicating that the overall structural model is well fitted. gfi, AGFI, and CFI are the relative fit indices, and the recommended values of all three need to be greater than 0.95, and the closer the index value is to 1, the more the index value is to 0.95, and the closer the index value is to 0.95, the more the index value is to 1, and the more the index value is to 1. And the closer the index value is to 1, the better the model fits the sample data. In the table, GFI, AGFI, and CFI all reach the recommended values and reach the acceptable level. The closer the asymptotic error root mean square RMSEA value is to 0, the better the model fit is, and less than 0.08 is good. The RMSEA value in the table is 0.052 which is within the recommended value. Therefore, from the results of the above analysis, it can be seen that the structural model fits well with the sample data and can adequately respond to the influence of changes in residents' consumption behavior on the path of consumption upgrading under the condition of multiple factors.

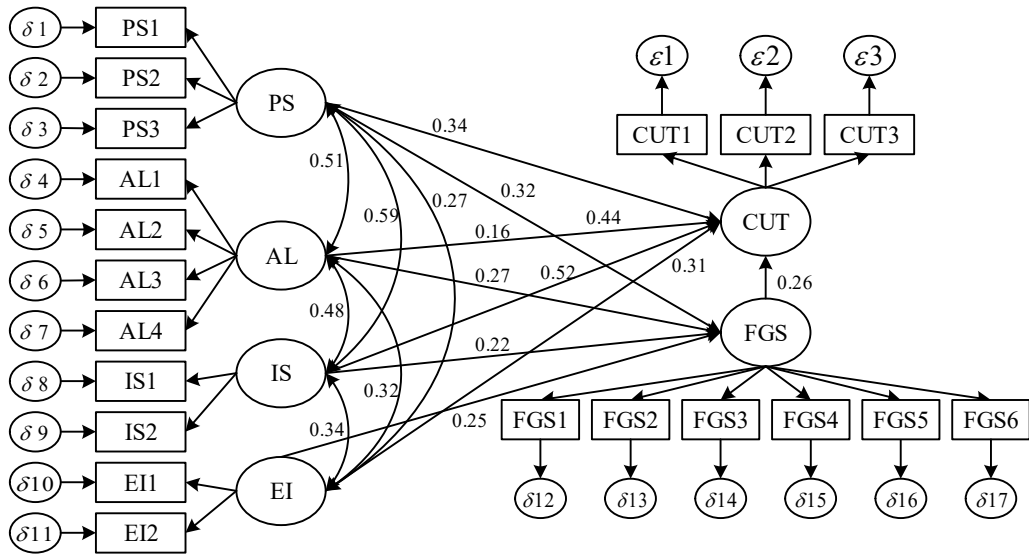


Fig. 3. SEM fitting results

Table 2. Structural model fitness indicator

Statistic	Adaptation value	Test result	Suitability
Chi-square/df	<3	2.817	YES
GFI	>0.95	0.948	YES
AGFI	>0.95	0.965	YES
CFI	>0.95	0.971	YES
RMSEA	<0.08	0.052	YES

5.1.2. Impact pathway analysis. Through the great likelihood method to test the model of residents' consumption behavior situation and influencing factors, we can get the path diagram of the structural equation model and the model test results, based on the fitting results of the structural equation model, and then get the results of the model path coefficient test and the standardized influence effect results as shown in Table 3 and Table 4 respectively.

As can be seen from the table, the path coefficients of demographic characteristics of residents' consumption behavior, capital and liabilities, insurance and protection, expenditure and income, financial literacy, grassroots governance and subjective evaluation all reach the 0.01 significance level. Calculating the marketing effect of each latent variable on the type of residents' consumption upgrading through the path standardized coefficient, it can be seen that the positive influence path of assets and liabilities (AL) on residents' consumption upgrading is the most significant, and its total effect value reaches 0.924, which indicates that the more the residents' assets and liabilities are, the higher the probability of their consumption behaviors occurring, which in turn promotes consumption upgrading. The positive influence paths of Expenditure and Income (EI) and Demographic Characteristics (PS) are relatively significant, with total effect values of 0.856 and 0.849, respectively. Comparatively speaking, Insurance and Security (IS), Financial Literacy, and Grassroots Governance and Subjective Appraisal (FGS) have a lesser effect on residents' consumption upgrading, but still show significance. In summary, the change of residents' consumption behavior under multi-factor conditions is influenced by a variety of factors, which affects the path of consumption upgrading.

Table 3. The path coefficient test results

Path	Normalization factor	S.E.	C.R.	P
PS→CUT	0.338	0.022	4.614	0.000***
AL→CUT	0.441	0.031	2.776	0.005***
IS→CUT	0.519	0.044	2.951	0.002***
EI→CUT	0.307	0.016	6.583	0.001***
FGS→CUT	0.264	0.023	2.334	0.003***

Table 4. Result of standardization effect

Latent variable	Consumption upgrade		
	Direct effect	Indirect effect	Total effect
PS	0.338	0.511	0.849
AL	0.441	0.483	0.924
IS	0.264	0.302	0.566
EI	0.519	0.337	0.856
FGS	0.307	0.254	0.561

5.2. Benchmark regression analysis

5.2.1. Benchmark regression results. Based on the benchmark econometric model constructed in the previous section, and the types of residents' consumption upgrading mainly include developmental consumption, enjoyment consumption and survival consumption, thus, this paper analyzes the three dimensions separately and uses the least squares method for parameter estimation. Table 5 shows the results of the benchmark regression, in which models (1) to (4) are the total consumption expenditure, developmental consumption expenditure, enjoyment consumption expenditure and survival consumption expenditure, and the regression coefficients indicate the marginal impact of each variable on the residents' consumption upgrading. *, **, *** denote significant at 10%, 5%, and 1% confidence levels, respectively, and robustness standard errors are in parentheses.

As can be seen from the data in the table, the coefficients of the regression of changes in residents' consumption behaviors on all types of consumption expenditures under multifactor conditions are all positive and the results are all significant. This means that the role of household residents' consumption behavior on all types of residential household consumption expenditure is positive, and every 1 percentage point rise in residents' consumption behavior, total household consumption expenditure rises by 0.246 percentage points, and developmental, enjoyment and survival consumption expenditure rises by 0.208, 0.327 and 0.262 percentage points respectively. It is easy to see that enjoyment-type and survival-type consumption expenditures are most affected by residents' consumption behavior, total consumption expenditures are second, and development-type consumption expenditures are least affected by residents' consumption behavior, and the regression result is in line with expectations. This is due to the survival-type consumption expenditure for families to meet the survival needs of the most basic consumption expenditure, its elasticity is relatively small, not easy to be affected by other factors, while the enjoyment-type consumption expenditure for the pursuit of the needs of a better material life for the residents of the family expenditure, due to its non-essential nature, has a greater degree of elasticity, by the greater limitations of the ability to consume, and therefore by the residents of the greater impact of consumer behavior, which can be seen residents of consumption behavior is conducive to promoting residents' consumption upgrading. In addition, among the various control variables, the effects of the sex of the head of household (SEX) and the sub-provincial marketization index (PMI) on the level of residents' consumption expenditure are negative and significant, while the effects of the remaining control

variables on residents' consumption expenditure are positive. Residents' consumption expenditure and the age of the head of household show an “inverted U-shaped” relationship, that is, with the rise of age, total consumption expenditure, development, enjoyment and survival consumption expenditure are first rising and then declining change rule, in line with the life cycle theory. To sum up, there is an obvious influence between residents' consumption behavior and consumption upgrading path under the condition of multi-factors, and it is more significant to affect residents' enjoyment consumption upgrading situation.

Table 5. The result of Benchmark regression

Variable	Model (1)	Model (2)	Model (3)	Model (4)
(Con_)	0.463***(0.027)	0.337***(0.048)	0.406***(0.063)	0.395***(0.082)
CB	0.246***(0.061)	0.208***(0.053)	0.327***(0.176)	0.262***(0.027)
SEX	-0.043*(0.023)	-0.147***(0.026)	-0.169***(0.031)	-0.081***(0.014)
AGE	0.018***(0.004)	0.018***(0.002)	0.024***(0.005)	0.009***(0.002)
MAR	0.199***(0.045)	0.424***(0.046)	0.443***(0.067)	0.177***(0.023)
EDU	0.035***(0.001)	0.051***(0.003)	0.051***(0.003)	0.046***(0.000)
HEAL	0.027***(0.016)	0.079***(0.015)	0.076***(0.015)	0.005(0.005)
INCOME	0.303***(0.014)	0.121***(0.015)	0.129***(0.026)	0.107***(0.005)
HNW	0.048***(0.000)	0.063***(0.006)	0.057***(0.003)	0.017***(0.002)
SCALE	0.045***(0.009)	0.116***(0.000)	0.119***(0.014)	0.084***(0.005)
LB	0.383***(0.051)	0.335***(0.056)	0.341***(0.069)	0.183***(0.026)
FFPL	0.343***(0.042)	0.479***(0.038)	0.486***(0.048)	0.003(0.023)
PI	0.128***(0.039)	0.153***(0.041)	0.159***(0.038)	0.231***(0.018)
GDP	0.316***(0.093)	0.581***(0.092)	0.592***(0.091)	0.554***(0.043)
PMI	-0.023(0.026)	-0.125***(0.024)	-0.149***(0.035)	-0.031***(0.012)
R ²	0.224	0.168	0.174	0.296

5.2.2. Robustness Tests:

1) Endogenous treatment. Firstly, due to the influence of changes in residents' consumption behavior on the path of consumption upgrading there may be a reverse causality, that is, the upgrading of residents' consumption will make residents' consumption demand expand, which in turn promotes changes in the consumption behavior of regional residents, secondly, the relationship between the two will be affected by some unobservable omitted variables, and finally, changes in the current period's consumption behavior of the residents may be affected by changes in the previous period's consumption behavior of the residents, which results in the The estimated coefficients of the model regression are biased and endogenous. In order to overcome the problems of omitted variables, measurement error and reverse causality due to the endogeneity problem, this paper uses the two-stage least squares (TSLS) method to accomplish this. Table 6 shows the results of the endogeneity test for changes in consumption behavior of residents.

In the selection of instrumental variables, we refer to the “Bartik instrument” constructed by existing studies, combine the local information with the national level information, and draw on the existing literature to use the product of lagged first-order change in consumption behavior (CB-1) and first-order difference in consumption behavior change in time ($\Delta CB - 1$) are considered as the product of instrumental variables in this paper. In order to verify the validity of the instrumental variables, the identifiability of the instrumental variables was first tested and from the results the p-value of the Kleibergen-Paaprk LM statistic was 0, thus strongly rejecting the original hypothesis that the instrumental variables could not be identified. Moreover, the Cragg-Donald Wald F statistic is 2329.164 and the Kleibergen-Paaprk Wald F statistic is 4076.885, both of which are significantly larger

than the critical value of 15.85 at the 10% bias level of the Stock-Yogo test for weak instrumental variables, thus rejecting the original hypothesis of the existence of weak instrumental variables. The data indicate that the instrumental variables selected in this paper are correct, and after considering the endogeneity issue, the changes in residents' consumption behavior are significantly conducive to consumption upgrading, indicating that the above regression conclusions are basically robust and largely reliable. A similar approach is used to test the stability of the influence mechanism, as can be seen in columns (2), (3) and (4) of Table 6, after adopting first-order differencing, the indicators from the three dimensions of developmental, enjoyment and subsistence consumption all reject the original hypothesis, and the regression results of the influence mechanism are considered to be more robust and reliable.

Table 6. Endogenous test results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
CB-1* Δ CB-1	0.281*** (0.028)	-	-	-
CB-1* Δ CB-1	-	0.124*** (0.017)	-	-
CB-1* Δ CB-1	-	-	0.169*** (0.009)	-
CB-1* Δ CB-1	-	-	-	0.205*** (0.043)
Control	YES	YES	YES	YES
(Con_)	0.148*** (0.053)	0.132*** (0.061)	0.069** (0.103)	0.151*** (0.045)
R ²	0.594	0.598	0.572	0.587
F statistic	203.29	199.85	197.41	200.53
Kleibergen-Paaprk LM statistic	419.682	422.115	298.335	316.279
Cragg-Donald Wald F statistic	2329.164	5142.629	4767.539	3965.264
Kleibergen-Paaprk Wald F statistic	4076.885	3967.683	3382.698	1642.602

2) Robustness test. To further prove the robustness of the benchmark regression results, new control variables are added. First of all, residents' consumption upgrading is not only related to the demographic characteristics of the head of household, but also to the demographic characteristics of other household members, so a series of new household demographic characteristics control variables are added, such as the age structure of household members, the gender structure, the average level of education, the employment rate, and the proportion of healthy household members. In addition, a dummy variable whether the household has a loan or not is added as a new household characteristic variable, which takes the value of 1 if the household has a loan, and 0 otherwise. To further verify the robustness of the results, four years of data from CHFS2011, CHFS2015, CHFS2017 and CHFS2019 are utilized, and after eliminating the samples with missing values and outliers, 2011 is taken as the baseline to construct the Four-year balanced panel data yields 22,457 samples with 7,279 households. In addition, residents' education and health care expenditures are large deterministic expenditures of households, and the removal of consumption expenditures other than education and health care expenditures serves as a new measure of residents' consumption upgrading. As a result, the robustness test is conducted from the above three dimensions, and the robustness test results are obtained as shown in Table 7. Where models (1) to (3) are the robustness test results of adding new control variables, adopting four-year balanced panel data and replacing explanatory variables, respectively.

As can be seen from the table, none of the regression coefficients change direction after adding new control variables, and the results are still robust, although the marginal effects are slightly reduced. The regression results obtained using the four-year balanced panel data are smaller than those obtained from the benchmark regression, but the change in residents' consumption behavior still has a significant effect with the consumption upgrade path at the 1% level. This suggests that the conclusion that changes in residents' consumption behavior stimulate residents' household

consumption expenditures is robust and credible, and helps promote residents' consumption upgrading. In model (3), even if the types of consumption expenditures such as education expenditures and medical expenditures are removed, changes in residents' consumption behaviors can still stimulate residents' household consumption expenditures and provide an influential path to realize residents' consumption upgrading, which also confirms that the above regression results are not affected by the types of consumption.

Table 7. Robustness test results

Variable	Model (1)	Model (2)	Model (3)
CB	0.158*** (0.019)	0.127*** (0.012)	0.109*** (0.015)
Control	YES	YES	YES
Individual effect	YES	YES	YES
Year effect	YES	YES	YES
Urban effect	YES	YES	YES
R ²	0.796	0.724	0.812
Adj. R ²	0.608	0.579	0.639

5.2.3. Heterogeneity analysis. For the heterogeneity of the regression results, this paper tests the two dimensions of child gender and regional division, and its specific test results are shown in Table 8.

1) Molecular female gender heterogeneity. Considering that the gender structure of family members will affect the family economic decision-making, and has been shown that families with sons will tend to increase the family savings and reduce the investment in risky assets, which makes the willingness to consume significantly inhibited. Then, does the gender difference of children affect the promotion effect of changes in consumption behavior on residents' consumption upgrading? In this paper, we divide the total sample into two subsamples, households with unmarried males aged 35 and below and households without unmarried males, and conduct regressions separately. The regression results of models (1) and (2) show that the effect of changes in residents' consumption behavior on the consumption of families with unmarried sons under the age of 35 is not significant, with a regression coefficient of only 0.005. This may be due to the fact that families with sons, in order to increase their competitiveness in the marriage market, tend to make more investment decisions in the housing asset class, and real estate investment requires a large amount of money, which makes families with sons not dare to overconsume, because of the future need for funds for the bride price or the purchase of a wedding house, so the role of changes in residents' consumption behavior on the consumption of families with unmarried sons under the age of 35 is not significant.

2) Sub-regional heterogeneity analysis. In order to verify whether there are regional differences in the impact of changes in residents' consumption behavior on residents' consumption upgrading, this paper divides the total sample into three sub-samples in the east, the center, and the west and conducts regressions separately. The regression results of models (3) to (5) show that changes in residents' consumption behavior will significantly promote residents' consumption upgrading in the eastern and central regions, with regression coefficients of 0.005 and 0.016, respectively, while there is no significant effect on residents' consumption upgrading in the western region. This may be due to the fact that there are large differences in the level of economic development and the level of residents' income in different regions of China, and the degree of regional Internet penetration is different. In the western region, the shortage of financial resources and the relatively backward development of traditional finance and information and communication networks have led to the relatively slow development of Internet finance, and the lack of awareness and conditions for residents to use finance

to realize wealth enhancement, which makes changes in the consumption behavior of the residents have no significant effect on the upgrading of residents' consumption.

Table 8. Gender and regional heterogeneity analysis

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
(Con_)	8.241*** (0.126)	9.334*** (0.158)	8.247*** (0.092)	2.914 (0.139)	10.552*** (0.131)
CB	0.005 (0.002)	0.009*** (0.002)	0.005** (0.001)	0.016** (0.007)	0.008 (0.002)
SEX	-0.012 (0.031)	0.005 (0.019)	0.015 (0.021)	-0.022 (0.034)	-0.005 (0.024)
AGE	0.002 (0.003)	-0.003* (0.000)	-0.002** (0.000)	-0.004 (0.003)	-0.002 (0.000)
MAR	0.011* (0.003)	0.005* (0.003)	0.005 (0.002)	0.006 (0.005)	0.008* (0.002)
EDU	0.035 (0.072)	0.101*** (0.032)	0.116*** (0.032)	0.101* (0.061)	0.034 (0.042)
HEAL	0.074** (0.027)	0.063*** (0.025)	0.081*** (0.025)	0.092* (0.051)	0.066** (0.031)
INCOME	0.061 (0.048)	0.066*** (0.005)	0.006 (0.046)	-0.058 (0.081)	-0.156** (0.062)
HNW	0.043*** (0.005)	0.011*** (0.002)	0.052*** (0.005)	0.072*** (0.011)	0.065*** (0.008)
SCALE	0.008*** (0.000)	0.036*** (0.006)	0.012*** (0.001)	0.012*** (0.005)	0.012*** (0.003)
LB	0.048*** (0.012)	0.135*** (0.011)	0.043*** (0.005)	0.042*** (0.015)	0.046*** (0.008)
FFPL	0.108*** (0.026)	0.188** (0.095)	0.137*** (0.011)	0.126*** (0.016)	0.135*** (0.015)
PI	0.205** (0.121)	-0.142*** (0.035)	0.285*** (0.107)	0.206 (0.104)	0.092 (0.111)
GDP	0.001 (0.182)	-0.046* (0.022)	-0.093** (0.045)	-0.254*** (0.074)	-0.224*** (0.063)
PMI	0.026 (0.081)	-0.114* (0.067)	-0.034 (0.006)	0.372* (0.215)	-0.043 (0.121)
Family	YES	YES	YES	YES	YES
Time	YES	YES	YES	YES	YES
R ²	0.185	0.142	0.173	0.212	0.198

5.3. Consumption upgrading path

5.3.1. Dissemination of consumer concepts. A survey of the consumer psychology of the population found that many residents still have a backward concept of consumption, believing that consumption in the direction of spiritual civilization is non-essential consumption. In daily life, they are not willing to take the initiative to pay for their own entertainment, preferring to save their money, and the consumption of means of production basically takes up most of their daily consumption, which is very unfavorable to the development of market economy. The government in the new era must strengthen the importance of spiritual civilization consumption, combined with the characteristics of spiritual civilization construction, focusing on the promotion of the elderly and youth groups, driving the young

and strong to participate in various recreational activities, and take the initiative to carry out knowledge consumption. Not only can help residents to grow their knowledge and broaden their horizons, but also to a certain extent can improve the residents' consumer goods, enhance the awareness of fraud prevention, so that residents can actively identify various types of consumer traps, correctly assess the quality of the product, and effectively improve the quality of their consumption.

To further unleash the consumption potential of the residents, the state must strengthen the importance of the construction of the residents' consumption environment. For many residents, in the process of consumption, easy to be cheated by unscrupulous operators, purchased products that are not the right price, the heavier will damage personal health, and even carry a huge amount of debt, which all lead to the reduction of the residents' enthusiasm for consumption, so that the residents' consumption of the long-term lack of vitality. Government departments should be combined with the characteristics of residents' consumption, according to the development direction of the new industry, new mode to formulate consumption policy, so that the consumption platform can be accurate under the guidance of the policy, to provide residents with more targeted products and home appliances home furnishing products. Government departments should also strengthen the importance of consumer market supervision, combined with the residents of daily consumption in the process of product problems and business problems, improve the consumer market access system and supporting business credit system, to ensure that residents to buy products have a clear source of traceability, in the event of problems, market management can be based on the existing mechanism, quickly find the source of the problem and the seller of the penalties.

5.3.2. Improving social security. Improving the social security system and increasing the consumer replacement rate for old-age insurance. The first is to increase publicity for old-age insurance, and to carry out activities to learn about relevant knowledge and policies, so as to help residents understand social old-age insurance. Second, expanding the channels of insurance fund formation, on the basis of the current fund-raising method of "individual contributions, collective subsidies and government subsidies", and making use of the power of social organizations such as industrial and commercial enterprises and public welfare institutions to deposit funds. Third, the burden of individual contributions should be reduced, and subsidy standards should be differentiated according to different income levels, with higher-income groups receiving less government subsidy and lower-income groups receiving more. Fourth, strengthen the government's responsibility, clarify the proportion of financial inputs by all levels of government, and establish a government financial burden mechanism similar to the personal income tax, with all levels of government delineating the amount of financial inputs according to the level of financial resources. Fifth, prudently formulate pension investment strategies, entrust qualified fund management institutions with investment and operation, standardize and make transparent the procedures for fund income and expenditure, and improve the efficiency of fund use. Sixthly, the level of benefits for insured residents should be gradually raised, and the amount of basic pensions paid should be dynamically adjusted in relation to the level of local economic development, price fluctuations, and the level of residents' incomes.

6. Conclusion

This paper explores the influence path between changes in residents' consumption behavior and consumption upgrading through structural equation modeling and multivariate linear regression modeling using panel data from the China Household Finance Survey Questionnaire from 2011 to 2019. The following conclusions are obtained:

1) The test result of Chi-square/df of the structural equation model is 2.817, which is significantly smaller than 3, indicating that the overall structural model fits well. And the fitted values of the model's GFI, AGFI, and CFI are all greater than 0.95, reaching an acceptable level. The positive influence path of assets and liabilities (AL) on residents' consumption upgrading is the most significant, and its total

effect value reaches 0.924, while insurance and protection (IS), financial literacy, and grassroots governance and subjective evaluation (FGS) have less influence on residents' consumption upgrading.

2) The coefficients of the regressions of changes in residents' consumption behavior on various types of consumption expenditures under multi-factor conditions are all positive, and the results are all significant. For every 1 percentage point rise in household residents' consumption behavior, total household consumption expenditure rises by 0.246 percentage points, and developmental, enjoyment and subsistence consumption expenditures rise by 0.208, 0.327 and 0.262 percentage points respectively. Therefore, changes in residents' consumption behavior under multi-factor conditions can significantly affect residents' consumption upgrading and provide reliable guidance for optimizing the path of residents' consumption upgrading.

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