Analysis of the Impact of Population Aging on the Household Consumption[1]

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Abstract

People at different age structure have different consumer demand. Changes in population age structure affect consumer demand and consumption structure of a country or region. With population aging more and more critical, the elderly have special requirements and habits of consumption, so it brings deep impact on household consumption.

Keywords: old aging; consumption structure; household consumption; disposable income

1. Introduction

Population aging is an inevitable trend with the development of the world's population. Increase of aging population in a country or region affects labor supply, wage levels, social dependency ratio, and so on. According to the theory of optimal inter temporal choice; these are important factors on household consumption. Thus exploring the impact of population aging on household consumption is critical for expanding domestic demand for China and for dealing with the aging crisis. This paper, by constructing econometric models, analyzes the impact of population aging on household consumption.

2. The Analysis of Impact of Population Aging on Consumption

2.1 Analysis of the Impact of Population Aging on the Structure of Household Consumption

Consumption structures epitomize the level of consumption and consumer attitudes, and reflect the trends of household consumption. Different people age structure, and different consumption structure. With income levels rising, their consumption levels rise correspondingly, consumption structure changes as well. Based on the impact of population aging on household consumption, the paper uses gray correlation to analyze the relationship between consumption structure and population aging.

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Table 1: The Average Per Capita Consumption Expenditure Structure Proportion of Urban Residents

Unit: %

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Food	39.18	37.94	37.68	37.12	37.73	36.69	35.8	36.29	37.89	36.52	35.67
Clothes	10.01	10.05	9.8	9.79	9.56	10.08	10.4	10.42	10.37	10.47	10.72
Housing	10.01	1032	10.35	10.74	10.21	10.18	10.4	9.83	10.19	10.02	9.89
Household equipment and services	8.79	8.27	6.45	6.3	5.67	5.62	5.73	6.02	6.15	6.42	6.74
Healthcare	6.36	6.47	7.13	7.31	7.35	7.56	7.14	6.99	6.99	6.98	6.47
Transportation and communication	7.9	8.61	10.38	11.08	11.75	12.55	13.2	13.58	12.6	13.72	14.73
Education, culture and entertainment services	12.56	13	14.96	14.35	14.38	13.82	13.8	13.29	12.08	12.01	12.08
Other goods and services	5.17	5.35	3.25	3.3	3.34	3.5	3.56	3.58	3.72	3.87	3.71

Data Sources: China statistical yearbook

Table 2: The Proportion of Rural Households' Per Capita Consumption Expenditure Structure

Unit: %

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Food	49.13	47.71	46.25	45.59	47.23	45.48	43	43.08	43.67	40.97	41.09
Clothes	5.75	5.67	5.72	5.67	5.5	5.81	5.94	6	5.79	5.82	6.03
Housing	15.47	16.03	16.36	15.87	14.84	14.49	16.6	17.8	18.54	20.16	19.06
Household equipment and services	4.52	4.42	4.38	4.2	4.08	4.36	4.47	4.63	4.75	5.13	5.34
Healthcare	5.24	5.55	5.67	5.96	5.98	6.58	6.77	6.52	6.72	7.2	7.44
Transportation and communication	5.58	6.32	7.01	8.36	8.82	9.59	10.2	10.19	9.84	10.09	10.52
Education, culture and entertainment services	11.18	11.06	11.47	12.13	11.33	11.56	10.8	9.48	8.59	8.53	8.37
Other goods and services	3.14	3.24	3.14	2.21	2.21	2.13	2.23	2.3	2.09	2.11	2.15

Data Sources: China statistical yearbook

Table 3: Population Age Structure of Urban and Rural Areas

unit: %

urban				rural		
年份 年龄	0-14岁	15-64岁	65岁以上	0-14岁	15-64岁	65岁以上
2000	18.43	75.27	6.3	25.49	67.16	7.35
2001	18.82	73.54	7.65	25.39	67.33	7.29
2002	18.325	73.59	8.075	24.06	68.34	7.58
2003	17.51	73.985	8.505	23.34	68.79	7.86
2004	14.255	74.725	8.59	21.49	70.05	8.44
2005	17.14	74.425	8.415	21.95	68.49	9.55
2006	15.94	75.34	8.72	20.65	69.82	9.54
2007	15.5	75.52	8.995	19.97	70.42	9.62
2008	15.01	75.785	9.205	19.4	70.81	9.79
2009	14.825	75.58	9.605	18.84	71.34	9.81

Data Sources: China statistical yearbook and Employment Statistics Yearbook

Considering the differences of population and consumption structures between urban and rural, this article studies the relationship between population and consumption structure in urban and rural separately, and analyzes the gray correlation results.

Firstly, define the parent sequence and sequences. The time series of population age structure is defined as the parent sequence: $\{y_1\}$, $\{y_2\}$ and $\{y_3\}$. y_1 represents the proportion of 0-14 year-old of the total population, y_2 represents the proportion of 15-64 year-old of the total population, y_3 represents the proportion of aged 65 and over of the total population. Sequence is defined as the proportion of all kinds of consumer goods $\{x_1\}$, $\{x_2\}$, $\{x_3\}$, $\{x_4\}$, $\{x_5\}$, $\{x_6\}$, $\{x_7\}$ and $\{x_8\}$, representing the proportion of food, clothing, household equipment and services, healthcare, transportation and communications, education-culture and entertainment services, housing, other goods and services. Based on the above data from 2000 to 2009, the software of gray system theory gray correlation is used to analyze the question.

Secondly, analyzing the correlation matrix between the proportion of population age structure of urban residents and the proportion of per capita consumption expenditure of urban households, the resolution factor is set to 0.5 at the same time, then the following:

$$R_{\text{urban}} = \begin{pmatrix} 0.889818 & 0.770588 & 0.821138 & 0.555755 & 0.735469 & 0.452669 & 0.65602 & 0.561172 \\ 0.973519 & 0.996817 & 0.984121 & 0.92299 & 0.919584 & 0.921784 & 0.943283 & 0.923318 \\ 0.929653 & 0.956203 & 0.946646 & 0.883232 & 0.906622 & 0.941957 & 0.910609 & 0.88497 \end{pmatrix}$$

Again, based on the data, the correlation matrix for rural residents can be reached, as following:

$$R_{\text{rural}} = \begin{pmatrix} 0.992469 & 0.901235 & 0.975636 & 0.889792 & 0.923263 & 0.989444 & 0.959754 & 0.973773 \\ 0.985988 & 0.891733 & 0.97708 & 0.875537 & 0.939416 & 0.987652 & 0.964986 & 0.955715 \\ 0.96743 & 0.878367 & 0.962476 & 0.862152 & 0.955365 & 0.970865 & 0.967953 & 0.938148 \end{pmatrix}$$

According to the correlation matrix of urban residents, the extent of demand of eight consumer species of urban elderly: clothing, housing, food, transportation and communications, healthcare, and other household equipment; then with the vertical age structure of correlation matrix, 0.941957>0.921784>0.452669, it's easy to see that increases with age, the level of demand for people in health care spending increases. Next, impact of demographic structure of rural residents on consumer spending, shows that the extent of demand of eight consumer species of rural residents: culture, entertainment, food, medical care, housing, transportation, communications, other, clothing and household equipment; then from the vertical age structure of correlation matrix, 0.967953>0.964986>0.959754,that the older, the greater the degree of people's demand for health care, and for the others, there is high level of demand for people aged 15-64.Last but not least, by contrast, the elderly population's demand for health care ,which is much larger in rural areas than the urban elderly population (0.967953> 0.941957).

Overall, increases with age, the elderly population has undergone certain physiological and lifestyle changes, which make food, medical care and cultural entertainment as a major aspect of the elderly population consumption. Impact of aging on the consumption structure is mainly manifested in the following aspects:

(1) Increase in health care spending. Due to physiological function declines, the elderly is susceptible to a variety of chronic diseases. Meanwhile, compared with children and labor force, the elderly pay more attention to health care, the demand for health care is more intense, and the level of medical requirements is also higher.

(2) Increase in spiritual and cultural spending. Population aging causes the increases of the consumption in the spiritual and cultural. Because of pressure of work and life, they cannot enjoy life when they were young. But later, the leisure time, the living environment and the pace of life changes. In order to improve the life quality, they began to focus on the needs of culture, education, recreation and other spiritual aspects.

(3) Increase in transportation and communication spending. With the increasing number of elderly traveling to relax increased, as well as empty nesters that have only child or the young child busy working out, telecommunications, call, and network becomes indispensable part of older life, and then their consumer spending increases.

2.2 Empirical Analysis of Population Aging on Consumption

Based on Keynesian theory of income, the paper adds the proportion of the aging population and other demographic variables to build an econometric model of consumption. At the same time, consumers' inter temporal choice is one of the factors. In general, due to different spending habits and spending plans (such as the children education in the future)of households, they prefer to save part of their savings for a rainy day rather than spend all the year savings when more expensive durable consumer goods spending is needed,. Therefore, their consumption is not only influenced by current income but also by several previous periods, or even more. More specifically, the effect of income on consumer spending exist hysteresis effect. Because people are also affected by spending habits, the spending before has an impact on current consumption, and this feature is called "ratchet effect".[2]

As shown below, there is a positive intercept exists in short-term consumption function, when the income decreases from Y_1, consumption does not follow the path of C_L, but follow the path of C_{s1}; When the income restoration from Y_{t1}, consumption follow the path of C_{s1} until it reaches the original highest income level.

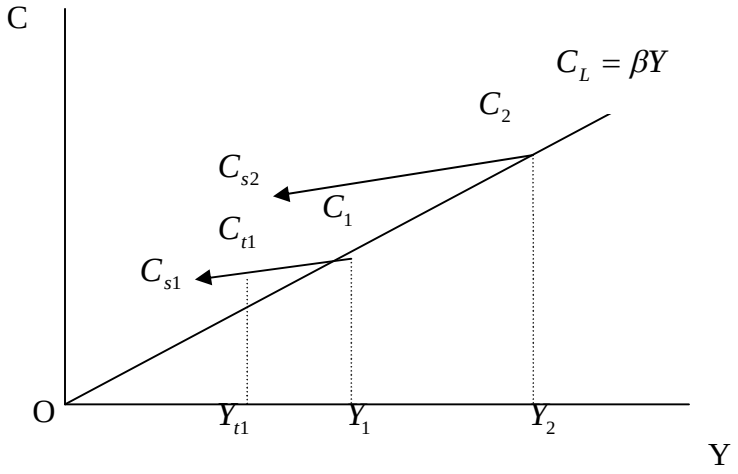

Figure 1 Ratchet Effect of Consumption

In establishing the regression model, if the impact of the factors or explanatory variables on the dependent variable has lag effect, these variables reflected the lagged effects would be introduced into the model. So, in the empirical analysis, this article adds lagged household disposable income (DPI (-1)) and lagged consumption rate (XIAOFEI (-1)). By introducing the population age structure variable factors, using the data from 1990 to 2010, it gets the model results as follows:

[2] Gao H.Y. Macroeconomics[M]. China Renmin University Press,2007.

Table 4: The Results of Analysis of the Consumer Model by EVIEWS Software

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(XIAOFEI(-1))	0.523303	0.115268	4.539885	0.0004
LOG(OLD)	-0.863040	0.215717	-4.000801	0.0012
LOG(DPI)	-0.100979	0.045795	-2.205004	0.0435
LOG(DPI(-1))	0.225425	0.051258	4.397825	0.0005
C	0.878561	0.233832	3.757238	0.0019

R-squared	0.849532	Mean dependent var	-0.207912
Adjusted R-squared	0.809407	S.D. dependent var	0.024115
S.E. of regression	0.010528	Akaike info criterion	-6.057275
Sum squared resid	0.001663	Schwarz criterion	-5.808342
Log likelihood	65.57275	Hannan-Quinn criter.	-6.008680
F-statistic	21.17218	Durbin-Watson stat	2.113071
Prob(F-statistic)	0.000005		

Logarithmic form of model variables can reduce heteroscedasticity of variables. By observing the above results, the correlation coefficient is 0.809407, at the 5% significance level, the independent variable and the constant term passed T-test, and the value of DW is 2.113071.It shows that the model fit better, parameters design reasonable ,and can be used to analyze the relationship between consumption, income and aging. The model empirical formula can be written as:

$$\begin{aligned} LOG(XIAOFEI) = {} & 0.5233 * LOG(XIAOFEI(-1)) - 0.86304 * LOG(OLD) \\ & - 0.100979 * LOG(DPI) + 0.2254 * LOG(DPI(-1)) + 0.87856 \end{aligned}$$

3. Conclusions and Recommendations

3.1 Conclusions

Firstly, the correlation coefficient between two consecutive periods of consumption is 0.5233, which shows that our country has a stable consume. Current consumption significantly affected by the previous period consumption, which verifies the consumer has a lag effect. Chinese residents are diligent and thrift, have more cautious consumer behavior, and consumption habits and consumption levels are stable. When consumers decide current consumption, they cannot get rid of past spending habits, which can be inferred in the near future, the level of consumption of the residents will continue to maintain the existing status.

Secondly, elderly population's influence on consumption coefficient is 0.863, which shows population aging has a negative impact on the consumer, and increase in the elderly population reduces consumption and total consumption of residents. At present, China's consumption rate is low when compared to other countries and regions, demographic factors probably also the reason for this phenomenon. From the family micro-level, the increase of the elderly population would reduce household income level, is not conducive to improving household per capita consumption levels. Although the growth of the elderly population will cause an increase in elderly consumer market demand, but also reduce the workforce. In fact, the spending power of the labor force is the highest. According to research at home and abroad, the purchasing power of the elderly population is equivalent to 0.8 of a labor. So, with the growth of the elderly population, the proportion of the labor force declined, the impact on the elderly consumer market is overshadowed by the negative impact on the economy. Overall, aging population increase has a negative effect on the ratio of consumption.

Thirdly, residents' income level of the current period's influence coefficient on consumption is 0.1009. The coefficient is negative, but not significant, the relationship with the previous period is positive, and the impact factor is 0.2254, which shows residents' current consumption depends more on the average disposable income of the previous period. Research results obtained coincide with the life-cycle theory, that people would make a long time consumer spending plan in order to achieve the best allocation throughout the life cycle of consumption.

Based on the above analysis, the population aging has negative effects to the residents' consumption, namely the increase of aging population decreases the consumption of residents. (1) In the long run, the proportion of older people is increasing, the decrease in output for accumulation and investment, per capita value stock declines, will affect the next generation, and finally suppress long-term consumption. (2)Prudent motive and bequest motive for the elderly population has important implications; they will accumulate property for the next generation. In face of disease risk, life expectancy, uncertain future, elderly population tends to increase savings. (3)Changes in family demographics affect the level of consumption for the entire family.

Thus, the aging population is not only to promote the elderly population through their own savings and consumption influence consumer behavior; changing family demographics, it is also to promote the next generation through savings and spending to influence consumer behavior.

3.2 Recommendations

(1) Further improvement of the social security system. China's aging population exhibits three main characteristics: a) "old before getting rich"; b) aging fast and large regional differences; and c) the aging population increasing the proportion of the elderly population. During aging process, it's necessary to accelerate the establishment of China's aging characteristics of Pension Security and Medicare, reduce people's motivation and prudent precautionary savings motive, around the elderly and other related industries such as medical, nursing and entertainment industries, develop "silver economy", and reach a new economic growth point.

(2) Relaxation of population policy. Family planning policy has been implemented for more than 30 years. Taking into account the effects of population structure, It is the appropriate time to relax the population policy, and to strengthen skills training of workers, training of high qualified workers, and to accelerate the rate of accumulation of human capital deepening and human capital, improve the core competitiveness and ensure the sustained and healthy development of economy and society.

(3) Development of a diversified consumer market. Promote sustainable economic development, enhance residents' disposable income, lower middle-aged crowd liquidity constraints, developing a diversified, multi-level consumer products market, to meet the needs of different consumer groups of people of all ages, stimulate consumption levels, and improve consumer structure.

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