Article

Population Aging and Household Tourism Consumption——An Empirical Study Based on China Family Panel Studies (CFPS) Data

Xing Cai [1]*and Yinhe Zhang [2]

[1] Business School of Hunan Normal University
[2] Business School of Hunan Normal University; yinhezhang@hunnu.edu.cn
* Correspondence: caixing@hunnu.edu.cn

Abstract: The ever deepening population aging has brought opportunities and challenges to the continued expansion of tourism consumption in China. In this article, the impact of population aging on household tourism consumption was studied from both theoretical and empirical aspects. First, the micro mechanisms of the impact of population aging on household tourism consumption were analyzed, which include economic condition mechanism, intergenerational care mechanism, health status mechanism and Internet use mechanism. Subsequently, the impact of population aging on household tourism consumption and its impact mechanisms were tested, and the heterogeneity analysis was conducted, by using the data of China Family Panel Studies (CFPS) from 2014, 2016 and 2018. The main conclusions of the article are as follows: (1) Population aging has a significant negative impact on household tourism consumption, and a series of robustness test results such as endogenous treatment support this finding. (2) The results of the impact mechanism test show that population aging has a negative mediating effect on household tourism consumption by reducing household economic conditions. The moderating effect of intergenerational care on the effect of population aging on household tourism consumption is insignificant. Health status of the elderly and Internet use have a significant positive moderating effect on the impact of population aging on household tourism consumption. (3) The results of the heterogeneity analysis show that the negative impact of population aging on household tourism consumption in urban areas is greater than that in rural areas, and the negative impact of population aging on household tourism consumption of families with the old-old elderly is greater than that of falimies with the young-old elderly. The conclusions of this article provide important references for activating tourism consumption in China in the context of population aging.

Keywords: population aging; household tourism consumption; intergenerational care; Internet use

1. Introduction

Since China's reform and opening up, the level of national income has risen significantly, and residents' need for a better life is growing day by day. As one of the rigid demands for a better life, the demand for tourism consumption presents a trend of continuous expansion. According to the *China Statistical Yearbook*, the number of domestic tourists increased from 524 million in 1994 to 6.06 billion in 2019, and the revenue from domestic tourism increased from 102.35 billion yuan in 1994 to 5.7 trillion yuan in 2019, an increase of nearly 11 times and 55 times respectively. Tourism consumption can not only meet the residents' need for a better life, enhance residents' sense of happiness and gain, but also be an important way to carry forward the Chinese culture, apply the new development philosophy, and promote the construction of a new development pattern in China. It is precisely because tourism is of great significance to the national economic and social development that China attaches great importance to the healthy development of tourism and the continuous excavation of tourism consumption. In 2009, tourism was identified as a strategic pillar industry of China's national economy. *Opinions on the Further Stimulating the Potential of Cultural and Tourism Consumption* promulgated by the General Office of the State Council in 2019 emphasized that the growth in culture and tourism consumption should be promoted, and its role in driving economic

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growth should be strengthened continuously. *The 14th Five-Year Plan for Tourism Development* issued in 2021 also put forward clear requirements for tourism. The plan emphasized that tourism should play a more prominent role in serving national economic and social development, meeting residents' cultural need, strengthening residents' power of spirit and promoting the improvement of social civilization.

At the same time, China's population structure is undergoing remarkable changes, and the degree of population aging continues to increase. According to data released by the National Bureau of Statistics, China's population aged 65 and above reached 88.27 million in 2000, accounting for more than 7% of the total population, and China officially entered an aging society. In 2021, China's elderly population aged 65 and above reached 200 million, accounting for 14.15% of the total population, entering an aged society. According to World Population Prospects 2019, the number of people aged 65 and above in China is likely to exceed 300 million by 2035, accounting for 20.68 percent of the total population and China will enter the stage of hyper-aged society. The rapidly deepening population aging has a profound impact on China's economy and society[1-3]. So, there are a series of questions worth exploring: has population aging had a significant impact on China's tourism consumption? What's the mechanism of its impact? How should we respond to the challenges brought by population aging and fully stimulate the potential of tourism consumption? Previous literature has overlooked the exploration of these issues. Based on this, we attempt to study and answer these questions from both theoretical and empirical aspects, and provide a reference for the introduction of relevant policies to promote tourism consumption in the context of population aging.

2. Literature review

With the increasing trend of population aging in various countries, the economic impact of population aging has attracted much attention from scholars. One of the most discussed topics is the impact of the population aging on household consumption. The life-cycle hypothesis proposed by Modigliani and Brumberg suggests that residents tend to smooth out consumption over time based on the total income over their life cycle, so as to maximize utility of a lifetime [4]. Residents' income come mainly from their prime years, so they will save to meet their retirement expenses when they have income. Thus, in each period of the life cycle, residents' consumption shows a smooth distribution, while the consumption rate presents a U-shaped distribution. Subsequently, numerous studies tested the validity of the life-cycle hypothesis, but obtained divergent findings. Some research results are consistent with the life cycle hypothesis [5-8]. While another part of the research results is inconsistent with the life-cycle hypothesis [9-13], which is called the "Retirement Consumption Puzzle" [14-15]. In addition, some studies examined the impact of population aging on China's consumption structure and found that a higher level of population aging significantly improved the consumption structure, especially in health care consumption [16-19].

As an important part of household consumption, tourism consumption is bound to be affected by population aging. Since tourism activities require healthy and energetic travelers. Scholars have focused mainly on the tourism needs of young and healthy people, but only a few studies have focused on the tourism needs of the elderly [20]. Up to now, the literature on the relationship between population aging and tourism consumption can be broadly divided into three categories. The first type of literature studied the characteristics of tourism consumption behavior of the elderly from the perspective of consumer behavior, and provided references for the marketing and management of destinations and tourism companies. Specifically, these studies include the analysis of travel motivation of the elderly [21-23], travel methods for the elderly [24-26], and travel restrictions of the elderly [27-29]. The second type of literature examined the effects of age and birth cohort on tourism consumption behavior from a household life-cycle perspective. Empirical studies of different economies obtained relatively consistent findings, that is, life cycle and birth cohort have a significant impact on travel decisions such as whether to travel, type of travel, and travel destination [30-34]. The third kind of literature used econometrics methods to study the influence of population aging on household tourism consumption. Some studies found that the deepening of population aging has a significant positive impact on household tourism consumption and travel willingness [35-36].

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However, Some studies obtained opposite conclusions [37]. In addition, an empirical study performed by Bernini and Cracolici using Italian household consumption data indicated that the elderly have a relatively low desire to travel but a relatively high tourism consumption [38].

In summary, relevant studies have been abundant. However, existing studies mostly investigated the characteristics of tourism consumption behavior and tourism consumption decision-making of the elderly from consumer behavior perspective. The effect and mechanism of population aging on tourism consumption are less discussed. Due to the differences in data and methods, a few existing empirical studies obtained non-identical results. So, we developed the existing research in the following aspects: first, a theoretical analysis framework of the influence of population aging on household tourism consumption was constructed and the influence mechanism was systematically analyzed. We considered that household economic conditions will mediate the effect of population aging on household tourism consumption, and intergenerational care, health status of the elderly, and Internet use will moderate the effect of population aging on household tourism consumption. Secondly, by using the micro-data from China Family Panel Studies (CFPS), we tested the effect and mechanism of population aging on household tourism consumption. Our empirical study found that the deepening of population aging can reduce household tourism consumption significantly. Thirdly, we conducted analyses of urban-rural heterogeneity and heterogeneity of the elderly's age. The results show that the negative impact of population aging on the tourism consumption of families in urban areas is greater than that of families in rural areas, and the negative impact of population aging on the tourism consumption of families with the old-old elderly is greater than that of falimies with the young-old elderly.

3. Theoretical analysis and research hypothesis

It is generally accepted that tourism activities must be predicated on good economic conditions, sufficient leisure time, good health and a strong desire to travel. Population aging will inevitably affect household tourism consumption through the four aspects mentioned above.

3.1. Economic condition mechanism

Household economic condition is one of the important influencing factors of tourism consumption decisions, and households with different age structures tend to have distinct differences in economic conditions. Therefore, population aging may affect household tourism consumption by changing household economic conditions. Relevant studies demonstrated that the elderly have more wealth than the young in developed economies [39-40]. Thompson and Thompson's report considered that people over 50 years old own 80% of the nation's private financial assets in the United Kingdom [41]. Unlike developed economies, the economic conditions of families with the elderly are worse than those of families without the elderly in China. In terms of revenue, the current target pension replacement rate in China is below 60% [42], which means that the overall level of per capita income of families with the elderly is lower than that of families without the elderly. From the perspective of family assets, on the one hand, China's social welfare system was not perfect in the past period, and families with the elderly spent more on pensions and medical care. On the other hand, families with the elderly have the motivation and behavior of gifting assets to their children in China, including purchasing property for children and leaving assets to children, etc. Relatively low levels of income and net assets will reduce the tourism consumption of families with the elderly.

H1. *Population aging has a mediating effect on household tourism consumption through household economic conditions, i.e., the deepening of population aging will deteriorate household economic conditions, which will inhibit household tourism consumption in turn.*

3.2. Intergenerational care mechanism

Leisure time is another factor that influences household tourism consumption decisions. In general, retired or near-retired seniors have more leisure time and are more likely to pursue personal interests, including participating in travel activities [43]. It is common for the elderly in China to participate in intergenerational care. According to the report of China Longitudinal Survey on

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Physical and Mental Health and Retirement in 2015, the intergenerational care of the elderly has two distinct effects on the leisure time of family members. On the one hand, intergenerational care will inevitably occupy the leisure time of the elderly and reduce their tourism consumption. On the other hand, intergenerational care of the elderly shares the burden of other family members and increases the leisure time of other family members, which may increase other members' tourism consumption. Intergenerational care will affect the influence of population aging on household tourism consumption, but the direction of this effect depends on the strength of two different directional effects mentioned above.

H2. *Intergenerational care takes up the leisure time of the elderly but increases the leisure time of other family members. Intergenerational care can moderate the effect of population aging on household tourism consumption, but the direction of the moderating effect is uncertain.*

3.3. Health status mechanism

Good health is a necessary prerequisite to participate in tourism activities. Compared with the young, the health status of the elderly is worse, and poor health status will affect household tourism consumption. First, poor health status will reduce physical strength and energy of the elderly, making them unable to meet the physical requirements of tourism activities and reducing their tourism consumption. Second, disabled elderly people not only have great obstacles to participating in tourism activities, but also need long-term care from other family members [44], which will reduce the leisure time of other family members and overall household tourism consumption. Third, the decline in the physical health of the elderly will increase the family medical care expenditure, which will crowd out household tourism consumption.

H3. *The decline in the physical health of the elderly has a negative moderating effect on the impact of population aging on household tourism consumption.*

3.4. Internet use mechanism

According to the "Push-pull" theory of tourism, tourists' activities are jointly determined by "push" and "pull" [45]. The "push" is the subjective desire of tourist to go on a trip, which is the external force that attracts tourists to a destination. The strength of the "pull" mostly depends on the efficiency of dissemination of tourism information. Compared with traditional media such as television, radio and newspapers, Internet has many advantages, such as wide coverage, fast communication speed, large amount of information and low operating cost, so it has become the most important communication channel of information (including tourism information) at present [46]. Tourism operators transmit information about tourism resources and services to tourists through the Internet, in order to shorten the psychological distance and perceptual distance between tourists and destinations [47]. It can be inferred that the use of Internet can transfer more abundant tourism information to the elderly, thus activating their travel intention and increasing the tourism consumption of families with the elderly.

H4. *Internet use has a positive moderating effect on the effect of population aging on household tourism consumption.*

4. Model and data

4.1. Model

4.1.1. Baseline model

To test the impact of population aging on household tourism consumption, the baseline model was set as follows:

$$Tc_{it} = \alpha_0 + \alpha_1 Old_{it} + \theta X_{it} + \varepsilon_{it} \quad (1)$$

Tc_{it} represents the tourism consumption of family i in period t, which is measured by per capita household tourism consumption. Old_{it} represents the degree of population aging of family i in period t, which is measured by the proportion of members over 65 years old in the family. X_{it} represents a

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series of control variables that may affect household tourism consumption [46, 48]. Family characteristic variables such as per capita household Income (*Income*), per capita net assets (*Asset*) and family size (*Size*). Householder characteristic variables include gender (*Gender*), age (*Age*), marital status (*Marriage*), working status (*Employ*), education background (*Education*) and household registration (*Hukou*). ε_{it} represents the random error term.

4.1.2. Model of mediating effect

H1 considers that population aging may have a mediating effect on household tourism consumption through household economic condition. In order to test whether H1 is valid, the following mediating effect model was set:

$$Tc_{it} = \alpha_0 + \alpha_1 Old_{it} + \theta X_{it} + \varepsilon_{it} \quad (2)$$

$$ME_{it} = \beta_0 + \beta_1 Old_{it} + \theta X_{it} + \varepsilon_{it} \quad (3)$$

$$Tc_{it} = \alpha_0 + \alpha_1 Old_{it} + \alpha_2 ME_{it} + \theta X_{it} + \varepsilon_{it} \quad (4)$$

Models (2)-(4) represent three steps of mediating effect test respectively. ME_{it} in model (3) and model (4) represents the mediator variables. In this paper, per capita household income (*Income*) and per capita household net asset (*Asset*) were used to measure household economic conditions.

4.1.3. Model of moderating effect

H2, H3 and H4 suggest that intergenerational care, the health status of the elderly, and Internet use may moderate the impact of population aging on household tourism consumption. To test these three hypotheses, the following moderating effect model was set:

$$Tc_{it} = \gamma_0 + \gamma_1 Old_{it} + \gamma_2 MO_{it} \times Old_{it} + \theta X_{it} + \varepsilon_{it} \quad (5)$$

MO_{it} in model (5) represents moderator variables, specifically including: ① Intergenerational care (*D_intergencare*). When the elderly participate in intergenerational care, *D_intergencare* is equal to 1, otherwise, equal to 0. ② Health status of the elderly (*D_health*). When there is no unhealthy elderly at home, *D_health* is equal to 1, otherwise, equal to 0. ③ Internet use (*D_internetuse*). *D_internetuse* is equal to 1 when at least one family member uses the Internet, otherwise, equal to 0.

4.2. Data description

The micro-data of China Family Panel Studies (CFPS) in 2014, 2016 and 2018 was collected. Since financial problem is one of the core problems of Chinese families, we referred to the method of Luo et al., identified householders by financial responders (the family member who is the most familiar with household finances and able to answer questions about the household finances in the past 12 months) [46]. Based on this, data related to family characteristics and householder characteristics were obtained by matching family questionnaires and individual questionnaires. Through data collection and cleaning, a final sample of 40,741 families was obtained.

The explained variable in this paper was measured by the per capita household tourism consumption, which was the total household tourism consumption divided by the total number of family members. Total household tourism consumption came from the question in the family economic questionnaire - "How much did your family spend on travel in the past 12 months?" The core explanatory variable was measured by the proportion of the elderly aged 65 and above in each family, which came from the age information in the family relationship questionnaire.

Three moderating variables were obtained in the following ways. First, the intergenerational care data came from the question in the individual questionnaire - "Do you help your children with household chores or babysit?" If elderly family members help their children care for grandchildren, there is intergenerational care in such families. Second, data on the health status of the elderly came from the question in the personal questionnaire - "How do you think your health status is?" There are five options in this question: "1 very healthy, 2 healthy, 3 relatively healthy, 4 general and 5 unhealthy." The first four options were defined as healthy state, and the fifth option was defined as unhealthy state. By combining personal health information with personal age information, the health status data of the elderly can be obtained. Third, data on household Internet use came from questions in the personal questionnaire - "Mobile Internet access or not" and "Computer Internet access or not".

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Households with at least one member Internet access are defined as Internet-using households. Table 1 shows the descriptive statistics of relevant variables.

Table 1. Descriptive statistics of relevant variables

Variables	Unit/Definition	Observations	Mean	Standard deviation	Minimum	Maximum
Explained variable						
Tc	ten thousand yuan/person	40144	0.046	0.206	0	7.5
Key explanatory variable						
Old	%	40741	17.252	30.383	0	100
Family characteristic variables						
Income	ten thousand yuan/person	39515	2.446	7.098	0	566
Asset	ten thousand yuan/person	38831	19.897	71.131	-7991.638	4006.5
Size	person	40741	3.624	1.881	1	21
Householder characteristic variables						
Gender	male=1，female=0	40727	0.52	0.5	0	1
Age	year	40741	49.774	15.008	11	95
Marriage	married=1，unmarried=0	40635	0.83	0.376	0	1
Employ	employed=1，unemployed=0	40200	0.745	0.436	0	1
Education	university degree or above=1，secondary school or below=0	40718	0.1	0.3	0	1
Hukou	non-agricultural hukou=1，agricultural hukou=0	40607	0.284	0.451	0	1
Moderating variables						
D_health	Is the elderly healthy? yes=1，no=0	40741	0.132	0.338	0	1
D_internetuse	Do family members use the Internet? yes=1，no=0	40741	0.589	0.492	0	1
D_intergencare	Do the elderly participate in intergenerational care? yes=1，no=0	27145	0.195	0.397	0	1

5. Empirical analysis

5.1. Baseline regression results

We used the TOBIT model for estimation, and also reported the OLS estimation results. Table 2 shows the baseline regression results of the impact of population aging on household tourism consumption. Columns (1), (3) and (5) are the OLS estimation results, columns (2), (4) and (6) are the TOBIT model estimation results. All likelihood ratio statistics are significant at the 1% level (Likelihood Ratio Test，LR), indicating that all three TOBIT models are valid. Columns (1) and (2) show the estimation results with only province fixed effects (FE_province) and year fixed effects (FE_year) added, columns (3) and (4) show the estimation results with family characteristic control

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variables added, and columns (5) and (6) show the estimation results with further householder characteristic control variables added.

Table 2. The results of baseline regression

	(1)	(2)	(3)	(4)	(5)	(6)
Explained variable	*Tc*	*Tc*	*Tc*	*Tc*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	TOBIT	OLS	TOBIT
Old	-0.0003***	-0.0024***	-0.0003***	-0.0023***	-0.0002***	-0.0007***
	(0.0000)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0001)
Income			0.0043***	0.0079***	0.0035***	0.0056***
			(0.0001)	(0.0004)	(0.0001)	(0.0003)
Asset			0.0004***	0.0012***	0.0003***	0.0009***
			(0.0000)	(0.0000)	(0.0000)	(0.0000)
Size			-0.0087***	-0.0266***	-0.0057***	-0.0136***
			(0.0006)	(0.0019)	(0.0006)	(0.002)
Gender					-0.0073***	-0.0091
					(0.002)	(0.0064)
Age					-0.0002***	-0.0052***
					(0.0001)	(0.0003)
Marriage					-0.0052*	0.0225**
					(0.0028)	(0.0091)
Employ					-0.0022	-0.0368***
					(0.0025)	(0.0082)
Education					0.1034***	0.2455***
					(0.0036)	(0.0095)
Hukou					0.0447***	0.249***
					(0.0025)	(0.0076)
Constant	0.2263***	0.0322	0.188***	-0.04	0.1496***	-0.0423
	(0.0101)	(0.0268)	(0.0101)	(0.0267)	(0.011)	(0.0294)
FE_province	Yes	Yes	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes	Yes	Yes
Obs	40143	40143	38144	38144	37561	37561
R^2	0.0576	0.0867	0.112	0.1329	0.1523	0.2269
LR test		3284.67***		4739.92***		7955.16***

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.001.

The estimated results in columns (1) - (6) of Table 2 demonstrate that the estimated coefficients of the proportion of the elderly in the family (*Old*) are all significantly negative at the level of 1%, indicating that population aging has a significant negative impact on the household tourism consumption. Since the estimated coefficient of the TOBIT model is the marginal effect of explanatory variable on the explained variable's latent variable, it is necessary to further calculate the marginal effect of explanatory variable on the explained variable. Taking the estimated results in column (6) as an example, the marginal effect of *Old* on *Tc* is −0.00014, indicating that per capita household tourism consumption will decrease by 1.4 yuan when the proportion of the elderly in the family increases by 1%. From the descriptive statistics in Table 1, it can be seen that the mean family size of

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the research sample is 3.624 persons and the mean per capita household tourism consumption is 460 yuan/person. It can be calculated that each additional elderly person will lead to a decrease of 38.63 yuan (i.e., 100×1.4/3.624) in per capita household tourism consumption, accounting for 8.4% of the mean of per capita household tourism consumption (38.63×100/460).

5.2. Endogeneity

Although the baseline regression was estimated with different methods, the possible endogeneity were not considered. The endogeneity of the baseline regression results may come from the following two aspects. The first is omitted variables. Although the control variables of family characteristics, householder characteristics and other aspects as well as provincial fixed effect and year fixed effect are added to the baseline regression, some omitted variables that are related to both explained variable and core explanatory variable may still exist. The second is the measurement error. The data of household tourism consumption came from the respondents' answers to the questionnaire, which may underestimate the real household tourism consumption. For reasons of information and memory, respondents may not be able to answer precisely the amount of household tourism consumption.

Serious endogeneity will lead to biased and inconsistent estimation results. We adopted the instrumental variable method to deal with the possible endogeneity problems. Effective instrumental variables must be correlated with endogenous variables (correlation) and affect the explained variables only through endogenous variables (exogeneity). We referred to the method of Card et al., took the agglomeration data as the instrumental variable, used the degree of population aging in villages and neighborhood committees (*Old_cunju*) as the instrumental variable of household proportion of elderly (*Old*), and conducted a two-stage regression [49-50]. On the one hand, the degree of population aging of villages and neighborhood committees is bound to be closely related to household proportion of elderly in the jurisdiction, which meets the correlation condition. On the other hand, the degree of population aging in villages and neighborhood committees will not affect household tourism consumption through other channels, which meets the exogeneity condition.

Table 3 reports the regression results using the instrumental variable method. In column (1), the estimated coefficient of *Old_cunju* is significantly positive at the level of 1%. Meanwhile, the Kleibergen-Paap F statistic is 2356.99, which is much larger than the critical value of 10, so *Old_cunju* meets the correlation condition. Columns (2) and (3) show the second-stage regression results obtained by the OLS method and the TOBIT model. No matter which estimation method is used, the estimated coefficient of *Old* is still significantly negative, indicating that the conclusion that population aging has a significantly negative impact on household tourism consumption is robust. Moreover, the absolute values of the estimated coefficients of *Old* in columns (2) and (3) are larger than those in columns (5) and (6) of Table 2, respectively, illustrating that the baseline regression results underestimate the inhibiting effect of population aging on household tourism consumption.

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Table 3. The results of endogeneity treatment

	(1)	(2)	(3)
Explained variables	*Old*	*Tc*	*Tc*
Methods of estimation	OLS	OLS	TOBIT
The regression stage	Stage I	Stage II	
Old_cunju	0.5227***		
	(0.0108)		
Old		-0.0005***	-0.0019***
		(0.0002)	(0.0005)
Constant	-19.4871***	0.1301***	-0.0721**
	(1.4769)	(0.0117)	(0.0323)
Family characteristic variables	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes
FE_province	Yes	Yes	Yes
FE_year	Yes	Yes	Yes
Obs	36140	36140	36140
R^2	0.4406	0.1497	
Kleibergen-Paap F	2356.99***		

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.001.

5.3. Robustness test

5.3.1. Replacing explained variable

In the baseline regression of Table 2, the per capita household tourism consumption was used as explained variable, which can better reflect the level of household tourism consumption, but cannot reflect the family's willingness to travel and the importance of tourism consumption in household consumption. To investigate the impact of population aging on household tourism consumption more comprehensively, this section used the household travel intention (*D_travel*) and the proportion of tourism consumption in total household consumption (*Tcratio*) as the proxy variables of household tourism consumption, and re-estimated them respectively.

When the per capita household tourism consumption is 0, that is, the family has no tourism consumption in the past 12 months, which means that the family has no travel intention. In this case, *D_travel* is equal to 0, otherwise, equal to 1. Since *D_travel* is a dummy variable, when it is used as the explained variable, the OLS test results will produce problems such as non-normality and heteroscedasticity of the random disturbance term. Therefore, We reported both PROBIT and OLS estimation results in columns (1) and (2) of Table 4. It can be seen that the estimated coefficients of *Old* are significantly negative, indicating that the increase in the proportion of the elderly in the family will significantly reduce the family's willingness to travel, which reflects the negative impact of population aging on household tourism consumption from another point of view.

Columns (3) and (4) of Table 4 report the regression results with *Tcratio* as the explained variable. It can be seen that the estimated coefficients of *Old* are significantly negative at the 1% level in both OLS method and TOBIT model, indicating that the deepening of population aging will reduce the proportion of tourism consumption in the total household consumption.

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Table 4. The regression results after replacing explained variable or key explanatory variable

	(1)	(2)	(3)	(4)	(5)	(6)
Explained variables	*D_travel*	*D_travel*	*Tcratio*	*Tcratio*	*Tc*	*Tc*
Methods of estimation	OLS	PROBIT	OLS	TOBIT	OLS	TOBIT
Old	-0.0003***	-0.0013***	-0.0024***	-0.0093***		
	(0.0001)	(0.0003)	(0.0085)	(0.0031)		
D_old					-0.0057**	-0.023***
					(0.0023)	(0.0078)
Constant	0.4445***	-0.1706**	2.0644***	-2.441***	0.1507***	-0.0388
	(0.0227)	(0.081)	(0.2323)	(0.6861)	(0.0111)	(0.0294)
Family characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes	Yes	Yes
Obs	37561	37561	35844	35844	37561	37561
R^2	0.1975	0.1756	0.1414	0.078	0.152	0.2265

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.001.

5.3.2. Replacing core explanatory variable

In the baseline regression result of Table 2, the proportion of the elderly in the family (*Old*) was used as the core explanatory variable, and its estimated coefficient reflects the marginal effect of changes in the degree of population aging on household tourism consumption, but cannot reflect the difference in tourism consumption between families with and without the elderly. For this reason, the presence of the elderly in the family (*D_old*, yes =1, no =0) was used to replace the proportion of the elderly in the family as the core explanatory variable. Columns (5) and (6) of Table 4 report the regression results of the OLS method and the TOBIT model. Furthermore, according to the results in column (6), the marginal effect of *D_old* on *Tc* is −0.0051, which means that the per capita household tourism consumption with the elderly is 51 yuan more than that of the family without the elderly, accounting for 11.09% of the average per capita household tourism consumption (i.e. 51×100/460).

5.3.3. Outlier processing

Our data on per capita household tourism consumption has a small number of outliers that deviate from the overall mean. Severe outlier problems may have an important impact on the regression results. In this regard, a right-end winsorization was adopted on the data of per capita household tourism consumption, with a winsorized quantile of 97.5. The regression results after winsorization are reported in columns (1) and (2) of Table 5. It can be found that the estimated coefficients of *Old* are still significantly negative at the level of 1%, indicating that outliers do not have an important impact on the regression results. The baseline regression results are robust.

There are also many 0 values in the data of the proportion of the elderly in the family. The above test results manifest that there is a significant difference in per capita tourism consumption between families with and without the elderly. Therefore, a question needs to be considered: in a family with the elderly, does the proportion of the elderly in the family have a significantly negative correlation with household tourism consumption? We conducted further regression after eliminating the

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samples of families without the elderly (i.e. eliminate samples with *Old* of 0). The regression results are shown in columns (3) and (4) of Table 5. The estimated coefficients of *Old* are still significantly negative, indicating that the negative correlation between population aging and household tourism consumption is robust.

Table 5. The results of outlier processing

	(1)	(2)	(3)	(4)
Explained variable	*Tc*	*Tc*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	TOBIT
Old	-0.0001***	-0.0004***	-0.0001*	-0.0008***
	(0.0000)	(0.0001)	(0.0001)	(0.0003)
Constant	0.075***	-0.0157	0.0742***	-0.3105***
	(0.0050)	(0.0145)	(0.0190)	(0.0643)
Family characteristic variables	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes
Obs	37561	37561	13007	13007
R^2	0.2383	0.3591	0.1074	0.2093

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.001.

5.4. Test of influence mechanism

5.4.1. Test of mediating effect

In this section, Models 2-4 were used to test H1, that is, whether population aging has a mediating effect on household tourism consumption through two mediating variables: per capita household income (*Income*) and per capita household net assets (*Asset*). The test results are shown in Table 6. Columns (1) and (2) report the results of the first step. It can be seen that the impact of the proportion of the elderly in the family on household tourism consumption is significantly negative when the mediating variable is not added. And the estimated coefficient of the TOBIT model is −0.0008. Columns (3) and (4) show the test results of the second step, which indicate that the proportion of the elderly in the family has a significantly negative impact on the mediating variables, that is, increase in the proportion of the elderly in the family reduces per capita household income and per capita household net assets. According to the results of the third step in columns (5) and (6), the proportion of the elderly in the family still has a significantly negative impact on household tourism consumption after the intermediary variable is added. The estimated coefficient of the TOBIT model becomes −0.0007, and the absolute value of this coefficient shrinks by 12.5%. It can be found that population aging has a partial mediating effect on household tourism consumption through per capita household income and per capita household net assets. H1 is verified.

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Table 6. The test results of mediating effect

	(1)	(2)	(3)	(4)	(5)	(6)
Explained variables	*Tc*	*Tc*	*Income*	*Asset*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	OLS	OLS	TOBIT
Test step	Step 1		Step 2		Step 3	
Old	-0.0002***	-0.0008***	-0.0082***	-0.0569***	-0.0002***	-0.0007***
	(0.0000)	(0.0001)	(0.0015)	(0.0144)	(0.0000)	(0.0001)
Income					0.0035***	0.0056***
					(0.0001)	(0.0003)
Asset					0.0003***	0.0009***
					(0.0000)	(0.0000)
Constant	0.194***	0.0475	50.5835***	830.9429***	0.1496***	-0.0423
	(0.0111)	(0.0296)	(0.3937)	(30.8653)	(0.011)	(0.0294)
Family characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes	Yes	Yes
Obs	39505	39505	38884	38233	37561	37561
R^2	0.1220	0.2046	0.0894	0.1337	0.1523	0.2269

Note: Standard errors in parentheses. * p< 0.10, ** p< 0.05, *** p < 0.001.

5.4.2. Test of moderating effect

In this section, model 5 was used to test H2-H4, that is, whether the intergenerational care, the health status of the elderly and the use of the Internet moderate the effect of population aging on household tourism consumption.

Columns (1) and (2) of Table 7 report the test results of the intergenerational care mechanism. The results show that the product term of the household proportion of the elderly and intergenerational care (*Old*×*D_intergencare*) is not significant, indicating that the intergenerational care of the elderly does not have a significant moderating effect on the effect of population aging on household tourism consumption. This result demonstrates that the different directional effects of intergenerational care are of similar strength, leading to a non-significant net moderating effect on the impact of population aging on household tourism consumption. The above results are consistent with H2.

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Table 7. The test results of moderating effect

	(1)	(2)	(3)	(4)	(5)	(6)
Explained variable	*Tc*	*Tc*	*Tc*	*Tc*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	TOBIT	OLS	TOBIT
Mechanism of influence	Mechanisms of intergenerational care		Mechanisms of health status		Mechanisms of internet use	
Old	-0.0002***	-0.0008***	-0.0003***	-0.0009***	-0.0003***	-0.0003**
	(0.0001)	(0.0002)	(0.0001)	(0.0003)	(0.0000)	(0.0002)
Old×D_intergencare	0.0001	0.0002				
	(0.0001)	(0.0003)				
D_intergencare	0.0132***	0.066***				
	(0.0045)	(0.0138)				
Old×D_health			0.0002**	0.0008**		
			(0.0001)	(0.0003)		
D_health			-0.0044	0.0347*		
			(0.0054)	(0.0202)		
Old×D_internetuse					0.0005***	0.0006**
					(0.0001)	(0.0003)
D_internetuse					0.0154***	0.1966***
					(0.0026)	(0.0094)
Constant	0.1834***	0.0649*	0.1542***	-0.0774**	0.1349***	-0.2249***
	(0.0143)	(0.0353)	(0.0124)	(0.036)	(0.0113)	(0.0306)
Family characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes	Yes	Yes
Obs	25458	25458	37561	37561	37561	37561
R^2	0.1583	0.2229	0.1524	0.228	0.1553	0.2449

Note: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.001.

Columns (3) and (4) of Table 7 report test results of the health status mechanism. It can be found that the estimated coefficients of product term of household proportion of the elderly and health status of the elderly (*Old×D_health*) are significantly positive at the level of 5%, indicating that the health status of the elderly has a significantly positive moderating effect on the effect of population aging on household tourism consumption, that is, the improvement of old family members' health status can weaken the negative impact of population aging on household tourism consumption. H3 is verified.

Columns (5) and (6) of Table 7 give the test results of the Internet use mechanism. The results demonstrate that the product term of household proportion of the elderly and Internet use (*Old×D_internetuse*) is significantly positive, indicating that Internet use has a positive moderating effect on the influence of population aging on household tourism consumption. H4 is verified.

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5.5. Heterogeneity analysis

5.5.1. Analysis of urban-rural heterogeneity

There are great differences in consumption habits between urban and rural residents in China, which may lead to urban-rural heterogeneity in the impact of population aging on household tourism consumption. So, we divided the total sample into an urban area sample and a rural area sample, and conducted regression respectively. The regression results are given in Table 8.

The regression results of urban area sample are reported in columns (1) and (2) of Table 8, and columns (3) and (4) show the regression results for rural area sample. It's clear that population aging can curb household tourism consumption significantly in both urban and rural areas. And the inhibitory effect of population aging on household tourism consumption in urban areas is greater than that in rural areas. This result is consistent with the findings of Jiang et al [37]. Because the income level in rural areas is relatively low and the social welfare system is not perfect enough, rural families have stronger precautionary saving motives and less demand for tourism consumption with higher income elasticity. Therefore, rural households' tourism intention and consumption are much lower than those of urban households. According to the sample statistics, 34% of urban households have tourism intention, but only 12.12% of rural households have the same intention. The per capita tourism consumption of urban households is 786.62 yuan, while that of rural households is only 104.19 yuan. The relatively low willingness and level of tourism consumption lead to small differences in tourism consumption among rural households with different levels of population aging. Another reason for urban-rural heterogeneity may be that the physical health of the rural elderly is better than that of the urban elderly [51]. The rural elderly's physical conditions can meet the physical and energy requirements of travel better. Therefore, the negative impact of population aging on household tourism consumption in rural areas is relatively small.

Table 8. The results of urban-rural heterogeneity analysis

	(1)	(2)	(3)	(4)
Explained variable	*Tc*	*Tc*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	TOBIT
Region	urban		rural	
Old	-0.0003***	-0.0008***	-0.0001**	-0.0003*
	(0.0001)	(0.0002)	(0.0000)	(0.0001)
Constant	0.1171***	-0.0883**	0.198***	0.0892*
	(0.0168)	(0.0368)	(0.013)	(0.0487)
Family characteristic variables	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes
Obs	18524	18524	18494	18494
R^2	0.1525	0.1815	0.0731	0.1726

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$.

The regression results of urban area sample are reported in columns (1) and (2) of Table 8, and columns (3) and (4) show the regression results for rural area sample. It's clear that population aging can curb household tourism consumption significantly in both urban and rural areas. And the inhibitory effect of population aging on household tourism consumption in urban areas is greater than that in rural areas. This result is consistent with the findings of Jiang et al [37]. Because the income level in rural areas is relatively low and the social welfare system is not perfect enough, rural families have stronger precautionary saving motives and less demand for tourism consumption with

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higher income elasticity. Therefore, rural households' tourism intention and consumption are much lower than those of urban households. According to the sample statistics, 34% of urban households have tourism intention, but only 12.12% of rural households have the same intention. The per capita tourism consumption of urban households is 786.62 yuan, while that of rural households is only 104.19 yuan. The relatively low willingness and level of tourism consumption lead to small differences in tourism consumption among rural households with different levels of population aging. Another reason for urban-rural heterogeneity may be that the physical health of the rural elderly is better than that of the urban elderly [51]. The rural elderly's physical conditions can meet the physical and energy requirements of travel better. Therefore, the negative impact of population aging on household tourism consumption in rural areas is relatively small.

5.5.2. The heterogeneity analysis of the elderly's age

There are differences in the consumption behaviors of the elderly in different age groups, which may also lead to the heterogeneity of the effect of population aging on household tourism consumption. We divided the family sample with the elderly into a family subsample with the young-old elderly (65-74 years old) and a family subsample with the old-old elderly (aged 75 and above). The regression results are shown in Table 9. The estimated coefficients of the proportion of the elderly in the family are significantly negative in Table 9, and the absolute value of the estimated coefficient of families with the old-old elderly is greater than that of families with the young-old elderly. This means that population aging has a stronger inhibitory effect on the tourism consumption of families with the old-old elderly. The statistical analysis of samples finds similar results: the per capita tourism consumption of the families with the old-old elderly is 305.77 yuan, which is lower than 366.83 yuan of the families with the young-old elderly. The main reasons for this result are as follows: compared with the young-old elderly, the old-old elderly have relatively worse health, so their travel ability and willingness are relatively low. At the same time, the increase in medical care expenditure will also crowd out household tourism consumption.

Table 9. The results of the elderly`s age heterogeneity analysis

	(1)	(2)	(3)	(4)
Explained variable	*Tc*	*Tc*	*Tc*	*Tc*
Methods of estimation	OLS	TOBIT	OLS	TOBIT
Age of the elderly	Families with the young-old elderly		Families with the old-old elderly	
Old	-0.0001***	-0.0004***	-0.0003***	-0.001***
	(0.0000)	(0.0002)	(0.0001)	(0.0002)
Constant	0.1475***	-0.0438	0.1497***	-0.0055
	(0.0121)	(0.0314)	(0.012)	(0.0309)
Family characteristic variables	Yes	Yes	Yes	Yes
Householder characteristic variables	Yes	Yes	Yes	Yes
FE_province	Yes	Yes	Yes	Yes
FE_year	Yes	Yes	Yes	Yes
Obs	33000	33000	30212	30212
R^2	0.1577	0.2273	0.1719	0.2322

Note: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$.

6. Conclusions and suggestions

In this paper, based on the data from China Family Panel Studies (CFPS), the effect and mechanism of population aging on household tourism consumption were studied. The conclusions can be drawn as follows. First, the increase in population aging significantly reduces household

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tourism consumption, and a series of robustness tests such as endogeneity treatment have obtained consistent results, which indicates that population aging will bring severe challenges to the development of tourism industry. Secondly, the test results of the influence mechanism demonstrate that the increase of population aging has a negative mediating effect on household tourism consumption by deteriorating household economic condition. The intergenerational care of the elderly has no significant moderating effect on the influence of population aging on household tourism consumption. The improvement of health status of the elderly and household Internet use has significantly positive moderating effects on the impact of population aging on household tourism consumption. Thirdly, the results of heterogeneity analysis manifest that the negative impact of population aging on the tourism consumption of urban families is greater than that of rural families, and the negative impact on the tourism consumption of the families with the old-old elderly is greater than that of the families with the young-old elderly. Based on our research results, we propose the following policy suggestions to activate household tourism consumption in China under the background of population aging.

Firstly, the social welfare system needs to be further improved. For example, relevant departments should consolidate the national coordination of basic endowment insurance, promote the provincial coordination of medical insurance, and narrow urban-rural and regional differences in social welfare. Furthermore, it is necessary to increase the coverage and level of basic endowment insurance and basic medical insurance, reduce the burden of household pension and medical care, weaken households' precautionary saving motives, and release the potential of household tourism consumption.

Secondly, the government should develop diversified childcare institutions actively and normatively, such as non-profit care institutions, for-profit childcare institutions and community daily care service stations, to share the burden of household child care, increase leisure time of family members (especially the elderly who participate in intergenerational care), and create conditions for families' tourism activities.

Thirdly, health education for the elderly should be strengthened to improve their health awareness. Meanwhile, the supply of high-quality medical care products and services for the elderly should be increased to improve their physical health and enhance their ability to participate in tourism activities. In addition, it is suggested to encourage communities and pension institutions to provide "breathing services" for families with disabled elderly members. In this way, the care burden of other family members can be reduced, and continuity time can be provided for other family members to participate in leisure activities such as travel.

Fourthly, tourism enterprises should take the initiative to adapt to the trend of population aging and adjust the structure of tourism products and marketing strategies purposefully, and try to understand the tourism consumption motivation and demand preference of the elderly by studying their consumption behaviors. Accordingly, market segmentation and service product design will be carried out to enhance the satisfaction of the elderly in the process of tourism and inspire their willingness to travel again.

Fifthly, the investment in Internet infrastructure should be increased to enhance the hardware conditions for the dissemination of tourism information on the Internet. Tourism enterprises should be encouraged to develop tourism service applications that meet the usage habits of the elderly or set up special sections for the elderly on existing tourism service platforms to provide customized travel information and services to seniors. At the same time, relevant departments should encourage tourism companies, seniors universities, elderly service institutions and community education institutions to provide training to the elderly in the use of the Internet, to eliminate the "Digital Divide" of the elderly. All in all, through the development and efficient use of Internet technology, the dissemination efficiency of tourism information can be improved, and the "Pulling Force" of household tourism consumption can be enhanced.

References:

1. Guo, X.B.; Li, T.P. The permanent impacts of population aging on economy and its policy suggestions. *J. Economic Theory and Business Management* **2013**, 33, 43-50. http://dx.chinadoi.cn/10.3969/j.issn.1000-596X.2013.02.005
2. Zheng, W.; Lin, S.J.; Chen, K. Characteristics and trend of population aging in China and its potential impact on economic growth. *J. The Journal of Quantitative & Technical Economics* **2014**, *31*, 3-20. http://dx.chinadoi.cn/10.13653/j.cnki.jqte.2014.08.001
3. Wang, W.; Liu Y.F.; Peng D.D. Research on effects of population aging on industrial upgrading. *J. China Industrial Economics* **2015**, 31, 47-61. https://www.cnki.net/kcms/doi/10.19581/j.cnki.ciejournal.2015.11.004.html
4. Modigliani, F.; Brumberg, R. *Utility analysis and the consumption function: An interpretation of cross-section data*, 1st ed.; Rutgers University Press: New Brunswick, America, 1954; pp. 38-41.
5. Horioka, C. Y. A cointegration analysis of the impact of the age structure of the population on the household saving rate in Japan. *J. Review of Economics and Statistics* **1997**, 79, 511-516. http://dx.doi.org/10.1162/REST.1997.79.3.511
6. Modigliani, F.; CAO, S.L. The Chinese saving puzzle and the life-cycle hypothesis. *J. Journal of Economic Literature* **2004**, 42, 145-170. http://dx.doi.org/10.1257/.42.1.145
7. Erlandsen, S.; Nymoen, R. Consumption and population age structure. J. Journal of Population Economics 2008, 21, 505-520. http://dx.doi.org/10.1007/s00148-006-0088-5
8. Wang, Y.P. The impact of population aging on urban household's consumption behavior in China. *J. Chinese Journal of Population Science* **2011**, 25, 64-73. DOI：CNKI:SUN:ZKRK.0.2011-01-007
9. Shoven, J.B.; Bernheim B.D. *National Saving and Economic Performance*, 1st ed.; University of Chicago Press: Chicago, America, 1991; pp. 305-348. https://EconPapers.repec.org/RePEc:ucp:bknber:9780226044040
10. Li, W.X.; Xu C.S.; Ai C.R. The impacts of population age structure on household consumption in China 1989-2004. *J. Economic Research Journal* **2008**, 54, 118-129. https://d.wanfangdata.com.cn/periodical/jjyj200807010
11. Attanasio, P.; Weber, G. Consumption and saving: Models of intertemporal allocation and their implications for public policy. *J. Journal of Economic Literature* **2010**, 48, 693-751. http://dx.doi.org/10.1257/jel.48.3.693
12. Mao, Z.G.; Sun, W.F.; Hong T. Comparative analysis on the relationship between population age structure and household consumption in China. *J. Population Research* **2013**, 37, 82-92. DOI：CNKI:SUN:RKYZ.0.2013-03-010
13. Sheng, L.Y.; Fang, X.D.; Feng Y.L.; Liu H.B. Study on the impact of changes in household population composition on household consumption: An analysis based on micro household panel data. *J. Statistical Research* **2021**, 38, 35-46. http://dx.chinadoi.cn/10.19343/j.cnki.11-1302/c.2021.11.003
14. Haider, S.; Stephens, M.J. Is there a retirement consumption puzzle: Evidence using subjective retirement expectations. *J. Review of Economics and Statistics* **2007**, 89, 247-264. http://dx.doi.org/10.1162/rest.89.2.247
15. Battistin, E.; Brugiavini, A.; Rettore, E.; Weber, G. The retirement consumption puzzle: Evidence from a regression discontinuity approach. *J. American Economic Review* **2009**, 99, 2209-2226. http://dx.doi.org/10.1257/aer.99.5.2209
16. Mao, R.; Xu, J.W. Demographic transition, consumption structure disparities and industrial growth. *J. Population Research* **2014**, 38, 89-103. https://rkyj.ruc.edu.cn/CN/Y2014/V38/I3/89
17. Ni, H.F.; LI, S.T.; He, J.W. Impacts of demographic changes on consumption structure and savings rate. *J. Population and Development*, **2014**, 20, 25-34. http://dx.chinadoi.cn/10.3969/j.issn.1674-1668.2014.05.004.
18. Wang, W.; Liu, Y.F. Population aging and upgrading of household consumption structure: An empirical study based on CFPS2012 data. *J. Journal of Shandong University (Philosophy and Social Sciences)* **2017**, 24, 84-92. http://dx.chinadoi.cn/10.3969/j.issn.1001-9839.2017.05.010.
19. Qi, H.Q.; Liu, Y. Change of population age structure and the upgrading of household consumption: An empirical research based on CFPS data. *J. China Population, Resources and Environment* **2020**, 30, 174-184. DOI: 10.12062/cpre.20200920.
20. Liu, W.L.; Zhong, L.N. The trend and prospect of tourism research on the elderly from the perspective of healthy aging. *J. Tourism Tribune* **2022**, 37, 8-10. http://dx.chinadoi.cn/10.19765/j.cnki.1002-5006.2022.03.004.
21. Zhang, Y.L.; Li, Y.D. Research on travel motivations of elderly people based on content analysis method. *J. Journal of Beijing Technology and Business University (Social Science)* **2009**, 24, 101-106. http://dx.chinadoi.cn/10.16299/j.1009-6116.2009.05.013
22. Prayag G. Senior travelers' motivations and future behavioral intentions: The case of nice. *J. Journal of Travel & Tourism Marketing* **2012**, 29, 665-681. http://dx.doi.org/10.1080/10548408.2012.720153
23. Lu, J.Y.; Hung, K.; Wang, L.L. Do perceptions of time affect outbound travel motivations and intention? An investigation among Chinese seniors. *J. Tourism Management* **2016**, 53, 1-12. https://doi.org/10.1016/j.tourman.2015.09.003

24. Hu, P. Research on the elderly tourism consumption market and behavior mode: A case of Shanghai. *J. Consumer Economics* **2007**, 23, 86-89. http://dx.chinadoi.cn/10.3969/j.issn.1007-5682.2007.06.
25. Chen, W.Y.; Wang, K.C.; Luon, H.F. Does a friendly hotel room increase senior group package tourists' satisfaction? : A field experiment. *J. Asia Pacific Journal of Tourism Research* **2014**, 19, 950- 970. https://doi.org/10.1080/10941665.2013.833123
26. Glabiński, Z. Analysing the tourism activity of seniors by applying the method of participant observation. *J. Bulletin of Geography. Socio-economic Series* **2016**, 33, 55-70. https://doi.org/10.1515/bog-2016-0024
27. Huber, D.; Milne, S.; Hyde, K.F. Constraints and facilitators for senior tourism. *J. Tourism Management Perspectives* **2018**, 27, 55-67. https://doi.org/10.1016/j.tmp.2018.04.003
28. Li, Z.; Shu, H.Y.; Tan, T. Huang, S. Does the demographic structure affect outbound tourism demand? A panel smooth transition regression approach. *J. Journal of Travel Research* **2020**, 59, 893-908. https://doi.org/10.1177/0047287519867141
29. Hou, P.P.; Yao Y.B. Tourism constraints structure dimensions and mechanism of urban senior tourists —A research based on the grounded theory. *J. Tourism Science* **2021**, 35, 92-107. http://dx.chinadoi.cn/10.16323/j.cnki.lykx.20220107.001.
30. Lawson, R. Patterns of tourist expenditure and types of vacation across the family life cycle. *J. Journal of Travel Research* **1991**, 29, 12-17. https://doi.org/10.1177/004728759102900403
31. Oppermann, M. Travel life cycle. *J. Annals of Tourism Research* **1995**, 22, 535-552. http://dx.doi.org/10.1016/0160-7383(95)00004-P
32. You, X.R.; O'Leary, J.T. Age and cohort effects: An examination of older Japanese travelers. *J. Journal of Travel & Tourism Marketing* **2000**, 9, 21-42. https://doi.org/10.1300/J073v09n01_02
33. Sakai, M.; Brown, J.; Mak, J. Population aging and Japanese international travel in the 21st century. *J. Journal of Travel Research* **2000**, 38, 212-220. https://doi.org/10.1177/004728750003800302
34. Alegre, J.; Pou, L. Micro-economic determinants of the probability of tourism consumption. *J. Tourism Economics* **2004**, 10, 125-144. https://doi.org/10.5367/000000004323142452
35. Yi, X.J.; Sheng, W.; Yang, B.Y. The impact of household income and demographic characteristics on tourism expenditure: Empirical evidence based on the data of China's urban household survey. *J. Consumer Economics* **2016**, 32, 38-46. http://resource.hzlib.cn:8081/Qikan/Article/Detail?id=669805145
36. Xu, X.N. Urban aging and domestic tourism consumption: An empirical analysis based on VAR model. *J. Commercial Research* **2017**, 60, 165-169. http://dx.chinadoi.cn/10.13902/j.cnki.syyj.2017.01.021
37. Jiang, Z.P.; Sun, X.C.; Pu, Y. The household tourism consumption under the impact of population aging: Opportunities or challenges?—Micro evidence from CHFS. *J. Journal of Sichuan Normal University(Social Sciences Edition)* **2021**, 48, 68-77. http://dx.chinadoi.cn/10.13734/j.cnki.1000-5315.2021.04.008
38. Bernini, C.; Cracolici, M.F. Demographic change, tourism expenditure and life cycle behaviour. *J. Tourism Management* **2015**, 47, 191-205. http://dx.chinadoi.cn/10.1016/j.tourman.2014.09.016
39. Meneely, L.; Burns, A.; Strugnell, C. Food retailers' perceptions of older consumers in Northern Ireland. *J. International Journal of Consumer Studies*, **2008**, 32, 341-348. https://doi.org/10.1111/j.1470-6431.2007.00644.x
40. Kohlbacher, F.; Cheron, E. Understanding "silver" consumers through cognitive age, health condition, financial status, and personal values: Empirical evidence from the world's most mature market. *J. Journal of Consumer Behaviour* **2012**, 11, 179-188. http://dx.doi.org/10.1002/cb.382
41. Thompson, N.J.; Thompson, K.E. Can marketing practice keep up with Europe's ageing population?. *J. European Journal of Marketing* **2009**, 43, 1281-1288. http://dx.doi.org/10.1108/03090560910989885
42. Li, Z.; Wang H.D. The research on the target replacement rate of the basic pension insurance. *J. Insurance Studies* **2012**, 33, 97-103. http://dx.chinadoi.cn/10.13497/j.cnki.is.2012.02.013
43. Losada, N.; Alen, E.; Dominguez, T. Travel frequency of seniors tourists. *J. Tourism Management* **2016**, 53, 88-95. http://dx.chinadoi.cn/10.1016/j.tourman.2015.09.013
44. Gladwell, N.J.; Bedini, L.A. In search of lost leisure: The impact of caregiving on leisure travel. *J. Tourism Management* **2004**, 25, 685-693. http://dx.chinadoi.cn/10.1016/j.tourman.2003.09.003
45. Dann, G.M.S. Anomie, Ego-enhancement and tourism. *J. Annals of Tourism Research* **1977**, 4, 184-194. https://doi.org/10.1016/0160-7383(77)90037-8
46. Luo, R.; Peng, C.H.; Bao, X.Z. Internet usage and family tourism consumption: An analysis of intermediary effect of information channel. *J. Tourism Tribune* **2022**, 37, 52-66. http://dx.chinadoi.cn/10.19765/j.cnki.1002-5006.2022.00.011
47. Sun, G.J.; Wang, D.; Ding, Z.F. Internet use and tourism consumption of Chinese residents: Empirical evidence from China family panel studies. *J. Finance & Economics* **2020**, 392, 81-93. http://dx.chinadoi.cn/10.3969/j.issn.1000-8306.2020.11.007.
48. Cai, L.A.; Hong, G.S.; Morrison, A.M. Household expenditure patterns for tourism products and services. *J. Journal of Travel & Tourism Marketing* **1996**, 4, 15-40. https://doi.org/10.1300/J073v04n04_02
49. Card, D.; Krueger, A. School resources and student outcomes: An overview of the literature and new evidence from north and south Carolina. *J. Journal of Economic Perspectives* **1996**, 10, 31-50. https://www.jstor.org/stable/2138553

 doi:10.20944/preprints202305.1638.v1

50. Bentolima, S.; Michelacci, C.; Suarez, Z.J. Social contacts and occupational choice. *J. Economica* **2010**, 77, 20-45. http://dx.doi.org/10.1111/j.1468-0335.2008.00717.x
51. Li J.X.; Li, C.H. Health difference of the elderly between the rural and urban districts. *J. Population Journal* **2014**, 36, 37-47. http://dx.chinadoi.cn/10.3969/j.issn.1004-129X.2014.05.004.