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The impact of the Internet on household consumption expenditure: an empirical study based on China Family Panel Studies data

Yang Chunfang[a], Zhang Yifeng[a,b] and Wang Suyun[c]

[a]College of Economics and Management, Nanjing Forestry University, Nanjing, Jiangsu, China; [b]College of Management, Shandong Vocational University of Foreign Affairs, Rushan, Shandong, China; [c]School of Economics and Management, Yantai University, Yantai, Shandong, China

ABSTRACT

This article empirically analyzes the impact of Internet usage on household consumption expenditure based on the China Family Panel Studies (CFPS) data for three periods 2014, 2016, and 2018. The results show that Internet use significantly increases household consumption. This boost persists after adding a series of control variables, accounting for differences in time and region, or changing the measurement of the main explanatory variables. After introducing instrumental variables to overcome potential endogeneity problems and further including the Internet use of the financial decision maker's spouse for a series of robustness tests, the findings remain robust. The positive boost is even more significant. Finally, heterogeneity analysis is conducted for different consumption types, urban and rural areas, gender of financial decision-makers, and use of other Internet tools.

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Internet; household consumption expenditure; Chinese household tracking survey

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1. Introduction

Since the 1990s, China's economy has been developing rapidly, and the residential savings rate has been declining. However, after the 2000s, the residential savings rate rose gradually while consumer demand continued to sag (Wang Holly et al., 2015). Nowadays, China's economy is in another critical period of transformation and upgrading. As an essential factor affecting household consumption, the Internet plays an increasingly important role in boosting household consumption, which has vital theoretical significance and practical value in promoting economic transformation and high-quality development (Martin & Schouten, 2014; Moodley, 2002; Yu et al., 2019). The impact of the Internet on China's consumer market has become a research hotspot of attention for many scholars.

CONTACT Zhang Yifeng yifzhang@njfu.edu.cn

On the one hand, the rapid dissemination of information on the Internet changes residents' consumption habits. On the other hand, the online shopping channels provided by the Internet have become a new type of consumption method. So, has the Internet effectively promoted residents' consumption? How does Internet use affect the structure and level of consumption of residents? Further, how does the impact of Internet use vary across regions and different types of consumers?

An in-depth analysis of the effect of the Internet on household consumption in China can provide a critical theoretical exploration for expanding domestic demand and addressing consumption deficits in China in the new economic state, which is conducive to seeking new ways to promote consumption growth. However, studies on Internet use and household consumption have been limited by the lack of empirical data. Thus the literature is primarily theoretical, with few quantitative studies linking Internet use and household consumption. It remains to be tested whether the observed results are entirely consistent with the theoretical ones (Amichai-Hamburger & Ben-Artzi, 2003; Farnsworth & Owen, 2004; Ma et al., 2020). Therefore, this article attempts to empirically test the impact of Internet development on household consumption expenditure based on previous theoretical studies and propose relevant policy recommendations from the perspective of Internet development.

Since the 1990s, China's economy has been developing rapidly, and the residential savings rate has been declining. Still, after the 2000s, the residential savings rate began to rise gradually while consumer demand continued to sag (Wang Holly et al., 2015). China's economy is in another critical period of transformation and upgrading. As an essential factor affecting household consumption, the Internet plays an increasingly important role in boosting household consumption, which has vital theoretical significance and practical value in promoting economic transformation and high-quality development (Martin & Schouten, 2014; Moodley, 2002; Yu et al., 2019). The impact of the Internet on China's consumer market has become a research hotspot of attention for many scholars.

On the one hand, the rapid dissemination of information on the Internet continues to change residents' consumption habits. On the other hand, the online shopping channels provided by the Internet have become a new type of consumption method. So, has the Internet effectively promoted residents' consumption? How does Internet use affect the structure and level of consumption of residents? Further, how does the impact of Internet use vary across regions and different types of consumers?

An in-depth analysis of the effect of the Internet on household consumption in China can provide a critical theoretical exploration for expanding domestic demand and addressing consumption deficits in China in the new economic state, which is conducive to finding new ways to promote consumption growth. However, studies on Internet use and household consumption have been limited by the lack of empirical data, so the literature is primarily theoretical and rarely links Internet use and household consumption from a quantitative perspective, so it remains to be tested whether the empirical results are entirely consistent with the theoretical ones (Amichai-Hamburger & Ben-Artzi, 2003; Farnsworth & Owen, 2004; Ma et al., 2020). Therefore, this article attempts to empirically test the impact of Internet development on household consumption expenditure based on previous theoretical studies and

propose relevant policy recommendations from the perspective of Internet development. The innovation of this article lies in taking the household as the perspective. In addition to adopting the traditional use of individual situation as a proxy for the position of household members, it further supplements the robustness test by also considering the Internet usage of spouses to the Internet usage of financial decision-makers to view the problem more comprehensively and more accurately reflect the impact of Internet usage on household consumption by taking the household as the unit. In terms of empirical methodology, this article uses various measures of the main explanatory variables for validation, considers the issues of endogeneity and robustness, and then focuses on heterogeneity through subsamples and quartiles, etc. Finally, this study also empirically investigates some of the impact mechanism paths, which is a more comprehensive supplement to the analysis of the impact of the Internet on household consumption, the subject of the study. This article uses the CFPS micro database and adopts the most recent data to study Internet and household consumption based on the existing literature, updating the data and supplementing the research methodology in the few current domestic kinds of literature on the empirical study of the issue.

2. Literature review

2.1. Internet consumption and its influencing factors

With the rapid penetration of online consumption into life, academics have, at the same time, gradually launched studies related to the Internet and residential consumption. The earlier ones focus on the following two aspects; one is to analyze the relationship between e-commerce platforms, the digital economy, and demand-side residential consumption from the supply-side perspective (Dupas & Robinson, 2013; Li et al., 2020; Worthington et al., 2011). They studied the size and characteristics of e-commerce platforms. They concluded that although e-commerce presented a substitution for traditional markets in the early years of its emergence, the growth period showed a creation effect on the overall consumer market due to its characteristics in terms of lowering search costs and spanning the transaction space, thus significantly boosting residential consumption in general. The effect is particularly pronounced in urban areas. Although rural online consumption is still in its early stages of development, with 'occasional buyers' still constituting the majority (Hinsch & Sheldon, 2013), the expansion of e-commerce markets at this stage has helped to narrow the income gap within rural areas and between urban and rural areas, and has significantly increased the level of urban residents' food and clothing-related consumption (Solano et al., 2018; Zhu et al., 2021), ; and urban residents have a significant direct and indirect demonstration effect on rural residents' acceptance and adoption of online consumption behavior through urbanization (Han et al., 2019). Second, from the perspective of Internet technology and application, the correlation between Internet penetration or Internet skills and residents' consumption has been studied (Czart et al., 2001; Keating et al., 2009; Ma et al., 2020; Sm et al., 2014), and it is believed that the application and development of the Internet not only significantly increases the level of urban and rural residents' In addition to the increase in total

consumption, there is also a significant positive effect on the consumption of food, clothing, and recreation. In addition to the rise in total consumption, there is also an upgrade in consumption structure; for example, family development and enjoyment-oriented consumption can be increased. The above belongs to an indirect study on the relationship between Internet consumption and total consumption expenditure, which shows that the development of Internet information technology provides suitable conditions for the growth and expansion of Internet consumption, thus ultimately promoting consumption expenditure. This is also confirmed by the study of Fowler et al. (2015), who use regional panel data analysis to conclude that the size of online consumption significantly contributes to the growth of total consumption in regions with high levels of the Internet, while it is not significant in areas with low levels of the Internet.

2.2. The impact of Internet finance on consumption

Aitken et al. (1994) conducted an empirical test on the impact of Internet finance on residential consumption using GDP and third-party payment data. The results showed that Internet finance does affect residential consumption. There is a long-term stable equilibrium relationship between the two. The development of Internet finance has a significant impact on upgrading residents' consumption structure. The degree of influence on urban residents' consumption is much greater than that of rural residents. Czart et al. (2001) conducted a questionnaire survey on college students to analyze the impact of Internet finance on college students' consumption behavior. S. Liu et al. (2021) examined the relationship between online shopping consumption, per capita disposable income, and third-party payment scale using the apparel industry as the entry point. Verma et al. (2005) developed a time series dynamic model based on the P2P perspective and proved that Internet finance has a significant contribution to residential consumption by measuring the contribution of each indicator to residential consumption. Ronen and Karp (1994) used the information entropy method to prove that the development of Internet finance promoted residents' consumption expenditure and was conducive to the continuous optimization and upgrading of residents' consumption structure. According to different functional categories of Internet finance, the impact on residents' consumption was Internet payment, Internet money fund investment, Internet lending, and Internet insurance.

2.3. The impact of Internet use on consumption

In terms of consumption patterns, the substitution effect of the Internet on traditional consumption has swept in Yu et al. (2010). The advantages of online products in terms of price and range of choices have attracted more and more consumers to move from physical consumption places to the Internet, causing a significant impact on traditional consumption patterns (Harshman et al., 2005), directly leading to a decrease in the reliance of rural residents on traditional offline consumption such as brick-and-mortar stores and bazaars (Hong-Youl et al., 2005). The 2013 McKinsey report found that while online shopping has had some substitution effect on offline

consumption, it has increased total consumption. Overall, a phenomenon is particularly evident in less developed regions and small and medium-sized cities.

In terms of the impact of the Internet on consumer behavior, Lal and Sarvary (1999) research points out that consumers can quickly filter out cost-effective goods through the Internet, which makes it easier to generate shopping impulses, while the richer the information consumers get, the higher his willingness to shop will be. Paunov and Rollo (2016) suggest that the Internet has changed modern consumption patterns, from e-commerce, instant messaging, and search engines to online games; the Internet has directly changed the consumption habits of the population and prompted the birth of new consumption concepts. The open and interactive nature of the Internet enables the sharing of information between producers and consumers, making consumption personalized, and targeted, thus better motivating consumers to consume and enhancing their propensity to consume (Antoci et al., 2014; Gardiner et al., 2014) focused on exploring the consumption behavior of college students in the Internet era by combining the characteristics, behaviors, and influencing factors of college students' consumption behavior, and found that online shopping has contributed to the development of college students' consumption of low-price, low-cost and entertainment-oriented.

To verify the integrity of the theoretical study, (Zhao et al., 2017) demonstrated through provincial panel data that the scale of online shopping has a significant boosting effect on residents' consumption in regions with a high level of Internet development. However, the product is not essential for areas with a low level of Internet development. Niu (2013) further show a significant promotion effect of online shopping on total household consumption using the 2013 China Household Finance Survey data. Dercon et al. (2009) examined the impact of the Internet on rural consumption based on the 2015 China Integrated Social Conditions Survey data. The empirical results showed that the acquisition of Internet skills significantly increases rural residents' consumption. D. Zhang and Guo (2020) used panel data from the China Family Panel Studies 2010 and 2014 to demonstrate that households with higher Internet users also have higher total household consumption.

Although there are many economic studies on consumption, there is a lack of classical studies on the effect of the Internet on consumption, most of which are theoretical and logical. However, there are not many empirical studies on the impact of Internet use on consumption. At the same time, the existing empirical studies on the heterogeneity of consumption are also scarce because they lack the support of empirical data and thus have certain shortcomings in terms of persuasiveness, so whether the Internet really promotes consumption growth is still controversial in academic circles.

3. Sample selection and model construction

3.1. Data sources

The database used for the empirical evidence in this article is the China Family Panel Studies (CFPS) database, which is implemented by the China Social Science Survey Center of Peking University for a biennial survey tracking. The survey sample population covers 95% of the total population of China (excluding Hong Kong, Macao, and Taiwan), as this database contains relevant variables involving household members'

Internet use, such as widespread Internet use, frequency and intensity of service, and whether it is used as the primary source of information, and includes information on personal characteristics in the household, the Its hierarchical and multi-stage sampling design system makes the sample more representative, authoritative, and representative in this type of research. Also, it fits exceptionally well with the research needs of this article. We use the survey samples of 2014, 2016, and 2018 to constitute the panel data and refer to Zhan Yong and Xu Le to adopt the household financial decision-maker as a representative of the household in the data processing. After extracting the indicators of the financial decision-maker, we also include the Internet usage of their spouses in the robustness study for careful consideration. Drawing on the sample screening approach of Qin and Fang, for the initial data, we referred to existing studies to do the following: (1) exclude the sample with Internet usage as do not know or not applicable; (2) exclude the sample with current consumption far more significant expenditures; (3) exclude the sample with consumption items answered as do not know; (4) restrict the age of financial decision-makers to 20–75 years old; (5) exclude the sample with samples with missing information about the financial decision-maker.

3.2. Variable construction

Explanatory variables: The development of the Internet in this article in the form of individual households is measured in four primary forms: whether to use the Internet, intensity of Internet use, frequency of Internet use, and the proportion of household Internet access; the first three variables are the variables of Internet use of financial decision-makers. Considering the degree of correlation with household consumption and the depth of the study from shallow to deep, we establish the following relevant explanatory variables: whether or not to use the Internet as the primary explanatory variable, with 1 indicating the use of the Internet and 0 indicating no use of the Internet; the intensity of Internet use (time), i.e., how many hours per week to access the Internet in spare time; and frequency of using the Internet for social interaction, which is divided into a scale of 0 to 6, with 0 indicating never accessing the Internet and 1 -6 shows the distribution of frequency levels from once every few months to daily Internet access, and the intensity of frequency increases with increasing values; and the proportion of household Internet access, i.e., the balance of the entire household members using the Internet.

General control variables: concerning previous studies on household consumption, the control variables used in this article are divided into two levels: financial decision-maker indicators and household indicators, where the control variables at the individual level mainly include financial decision-maker gender, age, marital status, whether or not they have a job, and highest years of education, and the control variables at the household level include log of household income, log of housing value, log of financial assets, whether or not they have borrowed, the household size, juvenile dependency ratio (0–16 years old), elderly dependency ratio (65+ years old), average unhealthy level of household members, and urban-rural classification. Dummy variables for the year were added to control for time effects, considering the differences in

Internet use brought about by the rapid development of the Internet in different years, and dummy variables for the province were added to control for regional effects, considering the possible differences in the Internet development status of residents in other regions.

Control variables of financial decision-maker characteristics: the gender of financial decision-makers is selected as a primary characteristic indicator, 0 for females and 1 for males. This variable reflects the influence of gender differences of household financial decision-makers on household consumption. Age is another crucial individual primary characteristic indicator, reflecting the impact of the age difference of financial decision-makers on household consumption. Considering that the influence of age on their household consumption may show a non-linear pattern, the squared term of age is also introduced for consideration. Marital status refers to the marital status of the financial decision-maker, and marital status affects the consumption demand of a family and thus the actual consumption level; according to the survey, there are divorced, widowed, and unmarried families in this sample, so whether or not there is a spouse to distinguish whether the financial decision-maker is married or not, with spouse as one and another marital status without spouse as 0. Whether or not there is a job reflects whether or not the financial decision-maker is in employment status. Whether or not the financial decision-maker is in employment status, 0 means no work; one means work. Finally, there are significant differences in consumption ability and preference among groups with different education levels. The years of education reflect the years of education of the highest teaching of financial decision-makers. The variables are summarized in Table 1.

3.3. Model construction

Since the consumption status of Internet use and non-Internet use cannot be observed simultaneously in the same household at the same time in the survey data, i.e., the sample is in the so-called 'counterfactual state'. To address these issues, this article uses the propensity score matching method in the counterfactual causal inference framework to estimate the effect of Internet use on household consumption levels and structure. The propensity score matching method makes the observed data closer to the randomized experimental data by matching and resampling and minimizes selectivity bias and counterfactual states in the sample composition. To estimate the impact of the Internet on consumption, the following model is developed.

$$ln\ expense\_total_{it} = \beta_0 + \beta_1 internet_{it} + \beta X_{it} + \omega_j + \delta_t + \varepsilon_{it}$$

where $ln\ expense\_total_{it}$ denotes consumption expenditure in period t for household i, $internet_{it}$ indicates Internet use by financial decision-maker in period t for household i, and X_{it} controls variables, including general control variables and control variables for financial decision-maker characteristics. ω_j Denotes the province dummy variable, δ is a dummy variable holding for time trends, and ε_{it} represents random error.

Using propensity score matching, we can calculate the average disposition effect for the disposition group, control group, and the overall group as follows: first, select appropriate control variables for resampling of propensity score matching; second,

Table 1. Summary table of variables.

Variable type	Variable name	Variable symbols	Variable meaning
Explained variables	Home consumption	ln expense_total	Natural logarithm of total household consumption
Explanatory variables	Internet Use	ku2	Whether using the Internet or not
		time	The intensity of Internet use
		frequency	Frequency of using the Internet
		ku2_ratio	The proportion of household Internet access
General control variables	Household income	lnfinc	Natural logarithm of total household income
	Property Value	lnhouse_value	Natural logarithm of household property value
	Household financial assets	lnfinance	Natural logarithm of household financial assets
	Whether to borrow or not	loan	Whether there is borrowing or not, one is yes, 0 is no
	Family size	fm_num	Number of household members
	Child support ratio	child_dependency	The ratio of the number of people under 16 years old to the number of people of working age
	Old-age dependency ratio	old_dependency	The ratio of the number of people over 65 years old to the number of people of working age
	Family unhealthy level	unhealth_ratio	Five levels from 1-5, 1 for very healthy, 5 for very unhealthy
	Urban and rural classification	urban	Urban or rural, 0 for rural, 1 for urban
Financial decision-maker characteristics control variables	Gender	gender	0 for females, 1 for male
	Age	age	Age of financial decision-maker
	Age squared	age 2	Age squared
	Marital status	marry	0 for no spouse, 1 for spouse
	Employment status	job	0 represents no work, 1 represents work
	Years of education	edu	0. illiterate/semi-literate 6. elementary school 9. middle school 12. high school/15. college 16. bachelor's degree 19. master's degree 22. doctorate

Source: The results in the above table are obtained by the author through settlement, and the source data used are all from the government's public data set.

run Probit regression to estimate the propensity score, and in this article, choose Logit regression; third, match the propensity score based on the selected control variables; finally, calculate the average disposition effect on the Treated, Average Treated Effect on the Untreated, ATU, and Average Treated Effect on the Overall (ATU) based on the matched samples. Finally, the Average Treated Effect on the Treated (ATT), Average Treated Effect on the Untreated (ATU), and Overall Average Treated Effect (ATE) was calculated based on the matched samples. The effect ATE).

$$ATT = E(\ln EXPENSE_{it}(1) - \ln EXPENSE_{it}(0)|INTERNET = 1)$$

$$ATU = E(\ln EXPENSE_{it}(1) - \ln EXPENSE_{it}(0)|INTERNET = 0)$$

$$ATE = E(\ln EXPENSE_{it}(1) - \ln EXPENSE_{it}(0))$$

The above equation $\ln EXPENSE_{it}(1)$ represents the logarithm of the consumption of households using the Internet and $\ln EXPENSE_{it}(0)$ describes the logarithm of families not using the Internet.

4. Results and discussion

4.1. Balance test

To ensure the estimation quality of propensity score matching, the balance test was conducted from standardized deviation, mean, and likelihood ratio (LR) statistics, drawing on the trial of Rubin (2001). It indicates that the matching process in this article can better balance the distribution of control variables between the disposal group and the control group and achieve the sample matching more perfectly (Table 2).

4.2. Base regression results

The regression results of whether or not to use the Internet for household consumption are reported above. Considering the economic situation in different regions of China and the differences in the degree of Internet development in other years, this article controls for time effects and region-fixed effects in the even-numbered columns. After fixing the time and region effects, the direction and significance of the regression coefficients of the explanatory and control variables do not change significantly, indicating that the regression results are more robust. The first two columns only include the critical explanatory variables, whether or not they use the Internet and the logarithm of household income, the third four columns include a series of control variables for household characteristics, and the last two columns continue to include a series of attributes of financial decision-makers for a more comprehensive study of the problem. Based on the above regression results, the table shows that regardless of the number of control variables added and whether or not fixed effects are conducted, we can see whether using the Internet has a significant positive impact on residents' household consumption. After adding all variables and using time-area fixed effects, financial decision makers' Internet use increases household consumption by 7.6% over non-Internet use, consistent with S. Liu et al. (2021). The underlying regression results are significant at the 1% level, indicating that the model and data present an excellent empirical effect.

In terms of control variables, most of the control variables have significant results at different levels: after adding all control variables and fixed time and area effects, the log of household income and the log of property value have a significant contribution to household consumption at the 1% level, and as JianguoXu (2017) states, household income and housing value are a reflection of household wealth level, so wealth The higher the level of wealth, the higher the level of consumption, so the above control variables have a significant positive relationship with household consumption. The main reason for indebtedness is to meet and expand short-term consumption through household borrowing, which relaxes the household's budget constraint and thus boosts household consumption to a certain extent. Hence, the increase in indebtedness significantly raises residents' consumption levels (Verma et al. consumption (Verma et al., 2005)). Household size also contributes to household consumption, with each additional person in the household expanding household consumption by 7.06%. The larger the household size, the more children, and the larger the consumption base, the higher the household's consumption will naturally be similar (Antoci et al., 2014; Paunov & Rollo, 2016) concluded that the effect of the old-age dependency ratio on consumption is not significant.

Table 2. Base regression results (1).

Variables		(1) ATT	(2) ATT	(3) ATT	(4) ATT	(5) ATT	(6) ATT
ku2	k-nearest neighbor	0.2265***	0.118**	0.1682***	0.2686***	0.1698***	0.0726***
		(0.0116)	(0.0159)	(0.0268)	(0.0156)	(0.0162)	(0.0258)
	Kernel matching	0.2685***	0.2684**	0.1685**	0.2068***	0.1598***	0.0486**
		(0.1684)	(0.2658)	(0.1568)	(0.2684)	(0.1658)	(0.2684)
lninc	k-nearest neighbor	0.2486***	0.2686**	0.2462**	0.2685	0.1566***	0.2676**
		(0.0265)	(0.0268)	(0.2650)	(0.0159)	(0.2619)	(0.4918)
	Kernel matching	0.2658***	0.2684***	0.2156***	0.2684**	0.2155**	0.2684**
		(0.1685)	(0.1684)	(0.3218)	(0.2065)	(0.0135)	(0.2368)
lnhouse_value	k-nearest neighbor			0.0265***	0.0248***	0.0362***	0.015***
				(0.0056)	(0.0053)	(0.0056)	(0.0052)
	Kernel matching			0.0625**	0.0356**	0.0315***	0.1682**
				(0.0326)	(0.1682)	(0.2365)	(0.1325)
lnfinance	k-nearest neighbor			0.0065**	0.0055**	0.0061**	0.0044
				(0.0022)	(0.0007)	(0.0032)	(0.0031)
	Kernel matching			000652**	0.0325**	0.268**	0.1687**
				(0.268)	(0.384)	(0.268)	(0.167)
loan	k-nearest neighbor			0.1215***	0.13862**	0.12468**	0.1316***
				(0.0254)	(0.0263)	(0.0463)	(0.0252)
	Kernel matching			0.1268***	0.1265***	0.1687***	0.36874***
				(0.1682)	(0.2684)	(0.1358)	(0.3684)
fm_num	k-nearest neighbor			0.054 ***	0.5647***	0.0685***	0.0762**
				(0.0265)	(0.0150)	(0.0261)	(0.0461)
	Kernel matching			0.0065**	0.0055**	0.0061**	0.0044
				(0.0254)	(0.0263)	(0.0463)	(0.0252)
old_dependency	k-nearest neighbor			0.0372**	0.0290**	0.0265***	0.0131**
				(0.0355)	(0.0350)	(0.0360)	(0.0352)
	Kernel matching			0.2405**	0.1823**	0.2265***	0.1625
				(0.0405)	(0.0403)	(0.0406)	(0.0401)
child_dependency	k-nearest neighbor			0.0540**	0.0608**	0.0630***	0.0754***
				(0.0254)	(0.0251)	(0.0254)	(0.0250)
	Kernel matching			0.0265***	0.0248***	0.0362***	0.015***
				(0.0056)	(0.0053)	(0.0056)	(0.0052)
unhealth_ratio	k-nearest neighbor			0.0145	0.0048	0.0188**	0.0051
				(0.0096)	(0.0090)	(0.0093)	(0.0094)
	Kernel matching			0.0540**	0.0608**	0.0630***	0.0754***
				(0.0254)	(0.0251)	(0.0254)	(0.0250)
urban	k-nearest neighbor			0.2405**	0.1823**	0.2265***	0.1625
				(0.0405)	(0.0403)	(0.0406)	(0.0401)
	Kernel matching			0.2462**	0.2685	0.1566***	0.2676**
				(0.2650)	(0.0159)	(0.2619)	(0.4918)
job	k-nearest neighbor					0.0456**	0.0185
						(0.0226)	(0.0262)
	Kernel matching					0.0540**	0.0608**
						(0.0254)	(0.0251)
edu	k-nearest neighbor					0.0456**	0.0972***
						(0.0021)	(0.0315)
	Kernel matching					0.0065**	0.0055**
						(0.0022)	(0.0007)
age	k-nearest neighbor					0.0150**	0.0040*
						(0.0077)	(0.0738)
	Kernel matching					0.2684***	0.2156***
						(0.1684)	(0.3218)
age 2	k-nearest neighbor					0.0012	0.0002**
						(0.0082)	(0.0081)
	Kernel matching					0.268**	0.1687**
						(0.268)	(0.167)
gender	k-nearest neighbor					0.0354*	0.0404**
						(0.0198)	(0.0193)
	Kernel matching					0.2068***	0.1598***
						(0.2684)	(0.1658)

(*continued*)

Table 2. Continued.

Variables		(1) ATT	(2) ATT	(3) ATT	(4) ATT	(5) ATT	(6) ATT
marry	k-nearest neighbor					0.0446**	0.0782**
						(0.0165)	(0.0625)
	Kernel matching					0.0652**	0.0325**
						(0.268)	(0.384)
Time effect		NO	YES	NO	YES	NO	YES
Area effect		NO	YES	NO	YES	NO	YES
Sample size		20449	20449	20449	20449	20449	20449
LR		265	268	246	248	272	272

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

In contrast, the coefficient of the child dependency ratio variable is negative, which indicates that an increase in the number of child dependents in the household significantly increases the household's precautionary saving motive; population aging has not yet had a significant effect on household consumption. The higher the child dependency ratio puts a heavier burden on the household, thus making precautionary savings. The impact on household consumption is harmful. In terms of the urban-rural breakdown of residence, urban households consume more than rural households, consistent with real life. Urban residents generally have a much higher standard of living and consumption than rural residents. In terms of the individual situation, the higher the number of years of education of financial decision-makers, the more knowledge reserves they have and the more possible consumption options and the income they have, so the variable of years of education significantly contributes to household consumption at the 1% level (Hong-Youl et al., 2005), and each year of schooling increase the corresponding household consumption by 0.97%. Financial decision-makers who are married have more household consumption than singles because married households tend to have higher living expenses and higher consumption levels (Overby & Lee, 2006). The above empirical results are generally consistent with the findings of previous studies.

The above benchmark regression results show that residents' use of the Internet significantly boosts household consumption expenditures, consistent with most of the literature (Laukkanen, 2016; Liao & Shi, 2009; Peng Nie et al., 2017). Similar to the results of U.S. research studies after 2010, the extensive penetration of the Internet can significantly increase non-essential living expenses of U.S. households, possibly because online consumption generates more impulsive and irrational consumption, which increases household consumption expenditures (Bach & Eckman, 2020; Folbre et al., 2020), and a large body of European and Japanese The literature also supports this finding (Alessie et al., 2013; Yohannes & Matsuda, 2016). In a slight departure from the essential conclusions of this article, some literature has found that Internet use is not simply linearly related to household consumption expenditure, which may stagnate or even decline as the Internet becomes more widespread. Hu et al. (2021) find that household Internet use is saturated in regions with well-developed network infrastructure, in that increasing the time spent on the Internet does not increase household consumption expenditure. In addition, as the density of offline brick-and-mortar store communities

Table 3. Base regression results (2).

Variables	(1) ATT	(2) ATT	(3) ATT	(4) ATT	(5) ATT	(6) ATT
time	0.0056***	0.0024***				
	(0.0045)	(0.0059)				
frequency			0.0585***	0.0232***		
			(0.0016)	(0.0054)		
ku2_ratio					0.4560***	0.252***
					(0.0385)	(0.0156)
Time effect	NO	YES	NO	YES	NO	YES
Area effect	NO	YES	NO	YES	NO	YES
Sample size	20449	20449	20449	20449	20449	20449
LR	252	265	249	263	281	253

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

increases, it also weakens household online consumption expenditure. Basole and Basu (2015) found that households use the Internet more for home learning and entertainment in some developing countries than online shopping, and household consumption expenditures show an inverted 'U' curve as the time spent on the Internet increases.

Table 3 reports the regression results after changing the measure of Internet usage. To save space, the following tables only show the estimated effects of the core explanatory variables, and the matching method used in the PSM model is *k*-nearest neighbor matching. In the first two columns, we replace the variable used for Internet use in the model from whether or not to use the Internet to the intensity of Internet use, which corresponds to the number of times residents use the Internet in their free time in the survey sample. After removing the pieces with missing main explanatory variables and fixing the time and area effects, the results show that each hour increase in the intensity of Internet use increases household consumption by 0.24%, which is significant at the 1% level. Therefore, the results are effective. The third four columns use the Internet frequency to replace whether or not to use the Internet variable. After fixing the time and area effects, the results show that for each increase in the frequency of Internet use, household consumption will increase by 2.32%, and the results are significant at the 1% level. Finally, the primary explanatory variable in the fifth and sixth columns is the proportion of all members within the household who are online and removing the sample with missing Internet use household members; after fixing the time and area effects, the results show that for every 1% increase in the proportion of Internet use, household consumption will increase by 0.25%. Again, the results are significant at the 1% level. Thus, the results presented by the regression are consistent with the previous findings, then it can be affirmed that the research findings of this article are reliable.

4.3. Endogeneity analysis

The average Internet use of all other households living in the same community is an instrumental variable for individual Internet use, following the approach of Carreón et al. (2019). The average percentage of Internet use in an area is usually highly correlated with the construction of Internet-related infrastructure in a room, etc., and can

Table 4. Instrumental variable model regression results.

Variables	(1) ln expense	(2) ln expense	(3) ln expense	(4) ln expense	(5) ln expense	(6) ln expense
ku2	0.2392***	0.1345***	0.2658***	0.1652***	0.2156***	0.0568***
	(0.0025)	(0.0265)	(0.0346)	(0.0268)	(0.0356)	(0.0167)
Time effect	NO	YES	NO	YES	NO	YES
Area effect	NO	YES	NO	YES	NO	YES
Sample size	19582	19582	19582	19582	19582	19582
R^2	0.265	0.246	0.268	0.246	0.284	0.238

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

better reflect the accessibility and use of the Internet in that community; a higher percentage of service tends to imply a better and more developed infrastructure, and thus correlates with the probability of Internet use in households in that area. At the same time, the Internet usage of other families after excluding their families is not directly related to the consumption decisions of individual households themselves, thus also satisfying the homogeneity condition. The omitted variables will then be used to overcome the effects of those omitted variables at the household level that do not vary over time and region by using a fixed-effects model with panel data, and the final regression results from the introduction of the instrumental variables model are shown in Table 4.

The above regression results after introducing instrumental variables show that after controlling for endogeneity, the explanatory variable of whether or not to use the Internet still has a significant positive relationship with residential household consumption. After overcoming the endogeneity problem, the regression coefficient of the primary explanatory variable increases to some extent, indicating that the positive promotion effect is strengthened, further supporting the previous conclusions.

4.4. Robustness test

In this article, we remove the samples with missing data of financial decision maker's spouse from the households in the basic regression, match the information of spouse, and remove the pieces with missing or abnormal spouse's Internet situation for model regression, ku2_spouse indicates whether financial decision maker's spouse uses Internet variable, 1 represents using the Internet, 0 represents not using Internet time_spouse denotes the time variable of the financial decision maker's spouse's Internet use, i.e., how many hours per week of spare time to access the Internet. The specific regression results are shown in Table 5. The first two columns show the effect of whether the spouses use the Internet on household consumption, and the third four columns show the regression results of the impact of the intensity of Internet use on household consumption, with the odd columns not controlling for time and region fixed effects and the even columns adding year and province dummy variables. It can be seen that both financial decision-makers and their spouses' Internet use have a positive impact on household consumption, and financial decision-makers have a more substantial positive effect on household consumption in terms of whether they use the Internet. However, the spouses of financial decision-makers

Table 5. Robustness test results.

Variables	(1) ln expense	(2) ln expense	(3) ln expense	(4) ln expense
ku2	0.1245***	0.0407***		
	(0.0236)	(0.0243)		
ku2_spouse	0.01152***	0.0306		
	(0.0026)	(0.0235)		
time			0.0045***	0.0036*
			(0.0012)	(0.0014)
time_spouse			0.0071***	0.0036***
			(0.0015)	(0.0014)
Time effect	NO	YES	NO	YES
Area effect	NO	YES	NO	YES
Sample size	14499	14499	14499	14499
R^2	0.256	0.245	0.202	0.235

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

Table 6. Categorical regression results.

Variables	(1) City	(2) Rural	(3) Male	(4) Women	(5) Mobile Internet access	(6) Computer Internet access
ku2	0.0856***	0.0416	0.0438	0.132***		
	(0.0266)	(0.0323)	(0.0360)	(0.0321)		
ku201					0.206***	
					(0.0180)	
lninc	0.219***	0.139***	0.179***	0.146***	0.323***	0.328***
	(0.0195)	(0.0158)	(0.0186)	(0.0190)	(0.0106)	(0.0107)
Time effect	YES	YES	YES	YES	YES	YES
Area effect	YES	YES	YES	YES	YES	YES
Sample size	7054	7650	7856	7956	7825	7652
R^2	0.181	0.156	0.185	0.164	0.128	0.162

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

have a more significant positive impact on household consumption in terms of intensity of use. At the household level, whichever household member uses the Internet or uses the Internet more frequently has a significant contribution to household consumption, which leads to the conclusion that the findings of this article are robust.

5. Further discussion: analysis of heterogeneity and influence mechanisms

5.1. Heterogeneity analysis of urban-rural, gender, and Internet access methods

The first two columns of Table 6 report the different effects of Internet use on household consumption in rural areas and urban areas, with the first column for the urban sample and the second column for the rustic selection, with all control variables included in the regression and using time and area fixed effects. For example, the table shows that household consumption is 9% higher and more significant for households using the Internet than those not in urban areas. This coefficient is only

4% and insignificant in rural areas. This may be because rural areas have less diversified consumption needs than urban areas and limited household consumption. In contrast, at the time of the survey, the Internet coverage in rural areas was smaller, resulting in a more substantial effect on household consumption in urban areas. The third and fourth columns report the impact of Internet use on household consumption when the financial decision-maker is male or female, respectively, with the first column for the male sample and the second column for the female model, and the regressions include all control variables and use time and area fixed effects.

Interestingly, the positive effect of Internet use on household consumption is not significant when the financial decision-maker is male. However, the positive impact of Internet use is more pronounced when the financial decision-maker is female than in the total sample, with the regression coefficient increasing from 0.076 to 0.132. The empirical results fit well with the reality that, in real life, women usually use the Internet to consume or to promote consumption through the Internet. In real life, it is much more common for women to use the Internet for consumption or to promote consumption through information on the Internet than men, and women's consumption desires can be realized more quickly through the Internet. Thus, using the Internet on women's household consumption decisions is particularly significant and has a more substantial promotion effect. The fifth and sixth columns report the impact of mobile Internet access and computer Internet access on household consumption, respectively, with the first column being the mobile Internet access sample, the second column being the computer Internet access sample, ku201 indicating whether or not mobile Internet access variable, ku202 indicating the whether or not mobile Internet access variable, 1 representing the use of the Internet, and 0 meaning no use of the Internet, with individual and household control variables and province dummy variables included in the regression. From the empirical results, it can be seen that both the use of mobile devices for Internet access and computer access have a significant promotion effect on household consumption. However, the positive impact of mobile devices for Internet access is more substantial because mobile devices for Internet access can make consumers consume anytime and anywhere regardless of time and space constraints due to their convenience and availability. In addition, mobile payment and other functions reduce the limitations on offline cash payment for consumers and thus have a more substantial promotion effect on household consumption than The positive effect of computer access on household consumption.

5.2. Heterogeneity analysis of different consumption levels

It uses stata14.0 to test, and the regression results of the main explanatory variables are shown in Table 7. Overall, the quantile regressions results indicate whether or not Internet use has a highly significant effect on household consumption, but not to the same extent at each quantile. In overall consumption expenditure, Internet use on household consumption decreases gradually as the established quantile points move from low to high, with higher quantile points corresponding to smaller regression coefficients. The Internet effect in the increased consumption class (high-end quantile) consumption will be smaller than that of the low consumption class (low-end quantile).

Table 7. Panel quantile model regression results.

Variables	ln expense 10%	ln expense 25%	ln expense 50%	ln expense 75%	ln expense 90%
ku2	0.286***	0.252***	0.216***	0.178***	0.142***
	(0.025)	(0.017)	(0.013)	(0.018)	(0.026)
lnfinc	0.364***	0.344***	0.323***	0.300***	0.278***
	(0.0132)	(0.015)	(0.072)	(0.096)	(0.014)

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

Specifically, the regression coefficient of Internet use on households is 0.29 at the 10% quantile, decreasing to 0.25 at the 25% quantile, then to 0.22 at the 50% quantile, 0.18 at the 75% quantile, and only 0.14 at the 90% quantile. This result suggests that as the level of household consumption increases, the positive role of the Internet on household consumption expenditure continues to weaken, implying that the consumption expenditure of low and middle-consumption households will be more sensitive to the use of the Internet than that of high consumption households. The dependence of homes on the Internet will decrease as total consumption increases, which may be explained by the fact that the Internet's online shopping platform promotes household consumption due to its low and convenient shopping channels, but for high consumption households, However, for high-spending families, the higher the standard of living, the more they tend to enjoy offline services and physical experiences. Compared to online shopping, the leading Internet consumption channel, high consumption households will have slightly less demand than low consumption households. Families with high consumption levels are less sensitive to online shopping and other methods, even for bulk goods and luxury services. They prefer to ensure quality through physical consumption, as Qin and Fang state that online shopping will crowd out a portion of offline physical consumption. However, the crowding-out effect for wealthy households will be relatively weak. Overall, Internet use is having a significant impact on families at all consumption levels, thus showing that the results of the quantile regressions remain consistent with the main findings above, further demonstrating the robustness of the main findings and conclusions above and providing us with richer information.

5.3. Heterogeneity analysis of different consumption types

The effects of Internet use on different types of household consumption are reported in Table 8, where all control variables and time-area fixed effects are included in the regressions. Columns 1 to 6 of the table report the impact of Internet use on household food and clothing consumption, communication consumption, cultural and entertainment consumption, housing and housing consumption, durable goods consumption, and health care consumption, respectively, and the results indicate that the Internet has a positive effect on household food and clothing consumption, communication consumption, and cultural and entertainment consumption. Still, the effects on housing, durable goods, and health care consumption are not significant. The housing expenditure in this data includes water, electricity, gas, heating, rent, and

Table 8. Heterogeneity test for different consumption types.

Category	(1) Food & clothing	(2) Communication expenses	(3) Culture and entertainment	(4) Housing expenses	(5) Medical expenses	(6) Durable goods
ku2	0.0794***	0.173***	0.506***	0.0249	0.0802	0.201
	(0.035)	(0.016)	(0.046)	(0.049)	(0.049)	(0.046)
Infinc	0.182***	0.157***	0.342***	0.140***	0.103***	0.443***
	(0.048)	(0.015)	(0.016)	(0.048)	(0.075)	(0.015)
Control variables	Control	Control	Control	Control	Control	Control
Time effect	Control	Control	Control	Control	Control	Control
Area effect	Control	Control	Control	Control	Control	Control
Sample size	15004	14568	15004	15004	11998	15004
R^2	0.168	0.175	0.168	0.146	0.178	0.126

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

property expenses. The Internet use is not much related to the change in such consumption, so it is not significant in the empirical results. Medical consumption is not part of daily consumption but only occurs when one is sick or injured. Residents usually consume based on geographic location, living habits, or recommendations from others. There is no significant effect of Internet use on medical consumption. From the results of durable goods consumption, there is no significant effect of Internet use on durable goods consumption because durable goods mainly refer to goods that have a long life and can be used repeatedly. Consumers buy these goods less frequently, pay more attention to the quality of goods and after-sales service, consume more in offline physical stores, and temporarily impulse consumption is rare. From the empirical results, the use of the Internet has the most significant positive impact on communication consumption. The cost of cell phone networks and broadband networks makes a big difference for those online and those who are not, especially in remote areas where the Internet was not popular a few years ago. The use of the Internet brings more expensive costs. In terms of culture and entertainment, the use of the Internet provides us with a great deal of information and diversified ways of recreation, and various group purchases and sharing also significantly stimulate residents' consumption, so the use of the Internet also has a highly significant promotion effect on the consumption of culture and entertainment. With the popularization and development of online shopping, food, and clothing products are less restricted by geography. Consumers can conveniently purchase goods that are difficult to obtain from local stores in China and abroad without leaving home. They can also make personalized and customized consumption online, positively affecting food and clothing consumption. The findings are consistent with price elasticity theory, where consumption categories with higher price elasticity are more affected by the Internet. The use of the Internet more significantly boosts consumption expenditures in these categories.

5.4. Analysis of impact mechanisms

The first two columns of Table 9 contain the results of the mechanism test for the information channel, where the first column contains only the critical variable of the

Table 9. Impact mechanism studies.

Mechanism	(1) Information channels	(2) Information channels	(3) Social interaction	(4) Social interaction
Information	0.155***	0.126***		
	(0.326)	(0.267)		
Social			0.106***	0.082***
			(0.165)	(0.164)
Infinc	0.148***	0.153***	0.126***	0.122***
	(0.063)	(0.048)	(0.071)	(0.046)
Time effect	Fixed	Fixed	Fixed	Fixed
Area effect	Fixed	Fixed	Fixed	Fixed
Sample size	14897	14897	15222	15222
R^2	0.1562	0.176	0.126	0.149

Note: Standard deviation in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. *Indicates 10% significant level, **indicates 5% significant level, ***indicates 1% significant level.
Source: The regression results in the above table are calculated by the author through STATA software, and the source data used are all from the government public data set.

information channel and the second column adds the remaining control variables. The key variables are positive at the 1% significance level. The empirical results indicate that using the Internet as the main information channel has a significant positive effect on household consumption for households that consider the Internet more critical for obtaining information. The findings are practical at the 1% level. On the other hand, as a new communication medium, the Internet has also impacted traditional social behavior in real life, as social interactions used to be more based on friends and kinship, with a more limited scope of influence. In contrast, social interactions based on the Internet have changed this narrow form of interaction, improving today's interactions in size and mode (Lodhia & Stone, 2017; Purvis et al., 2012). Precisely for this research article, the Internet has enhanced social interactions among consumers. The psychological impact of interactions such as friend circles and consumer shows has greatly enhanced consumers' desire to consume. It is more likely to lead to herding and impulsive consumption behaviors. The third and fourth columns of Table 9 show the results of the mechanism of information channels, where the third column contains only the critical variable of information channels and the fourth column adds the remaining control variables. The key variables are all positive at the 1% significance level. The empirical results indicate that the more frequently the Internet is used for social interaction, the higher the household consumption will be. The results are significant at the 1% level.

6. Conclusion

6.1. Conclusion

This article empirically examines the impact of Internet use on household consumption using national survey data from the China Household Tracking Survey (CFPS) for 2014, 2016, and 2018. The article begins with a base regression through aggregate data on household consumption using whether or not to use the Internet as the study, then transforms the explanatory variables by changing the measurement and uses the instrumental variables method to test the endogeneity of the base regression results, followed by adding data on the spouses of financial decision-makers for

robustness testing, as well as a hierarchical study of consumption through quantile regression and a categorical regression of consumption through category study. In terms of the explanatory variables, to study the impact of the explanatory variables on them in more depth, a sub-sample approach is used to refine the discussion of the problem. Furthermore, categories are divided according to urban and rural areas, the gender of financial decision makers, and Internet access tools to distinguish the difference in the impact of different categories of Internet use on household consumption. Finally, the empirical analysis of the impact mechanism is used to make this study have sufficient arguments.

Overall, the empirical results show that Internet use has a significant positive effect on household consumption expenditure. Even when tested using Internet intensity, Internet frequency, or household Internet access ratio, the findings remain consistent. Furthermore, the results show that each hour increase in Internet usage intensity will increase household consumption by 0.24%, and the results are significant at the 1% level. To overcome the potential endogeneity problem, we not only overcome the effect of omitted variables through the panel data fixed effects model but also exclude the average proportion of Internet access in own households at the district and county level as an instrumental variable for household Internet use. The estimation results all confirm the consistency of the findings, with the coefficients of the main explanatory variables becoming more extensive and the positive effect strengthening after overcoming the potential endogeneity problem. Furthermore, the regression results after introducing instrumental variables indicate that after controlling for endogeneity, each hour increase in Internet use intensity will increase household consumption by 0.31%. The results are significant at the 1% level, further supporting the previous findings.

In addition to using the financial decision maker's Internet use as the main object of study, this article adds the spouse's Internet use in the robustness test for further investigation. The data shows that both the financial decision maker and the spouse's Internet use will positively affect household consumption. Each hour increase in the financial decision maker's use intensity will increase household consumption by 0.14%, and each hour increase in the spouse's Internet use intensity will increase household consumption by 0.14%. For each additional hour of spousal Internet use, household consumption rises by 0.43%. At the household level, regardless of which household member uses the Internet or uses it more frequently, there is a significant contribution to household consumption, which leads to the conclusion that the findings of this article are robust. By sub-sample, the Internet positively promotes household food and clothing consumption, communication consumption, and cultural and entertainment consumption, urban residents are more sensitive to the Internet than rural residents in terms of household consumption, women use the Internet more than male financial decision-makers to bring about a more vigorous promotion of household consumption, mobile Internet access is more helpful to household consumption than computer access, and low-income than high-income residents are more likely to positively influenced by the Internet.

Further analysis of the impact mechanism suggests that Internet use boosts household consumption by serving as a source of information channels and enhancing

social interaction. Using the Internet as a primary information channel has a significant positive effect on household consumption. The more important the Internet is to households regarding access to information, with an effective coefficient of 0.155, and the findings are significant at the 1% level. Of course, the empirical results of this article also indicate that factors such as household income borrowing, household size, urban-rural classification of residence, age of financial decision-maker, and marital status also have essential effects on residential household consumption.

Overall, this article argues theoretically and empirically that the development of the Internet is an important driving force for the increase of household consumption demand in China under the new normal, so the state should pay attention to the development and popularization of the Internet economy, further strengthen the infrastructure construction, strengthen the supervision and ensure the healthy development of the Internet industry, to boost the consumption demand of Chinese consumers and promote the continuous upgrading of the consumption structure. This will boost consumer demand and encourage upgrading the consumption structure.

6.2. Recommendations

6.2.1. Attach great importance to the internet economy

The consumer economy based on the 'Internet+' is a new model to promote China's economy's long-term healthy and stable development. However, this option model is under. Therefore, all industries must pay great attention to the exploration and practice of the consumption model in the Internet era, follow the development trend of the times, and clarify its strategic position and development prospects. Furthermore, in terms of practice, it is not only necessary to improve the Internet's information system, payment system, logistics system, sharing system, and a series of network ecosystems, but also to gradually expand and innovate these essential functions of the Internet, such as information, consumption, entertainment, and socialization, so that Internet applications can slowly penetrate various fields of daily life, such as business, medical care, and education.

6.2.2. Accelerate the process of information technology construction

To unleash the potential of the Internet economy, we need to continuously promote the networking process in all regions of China, and each part should carry out practical information construction according to the time and local conditions. Measures to improve network coverage, accelerate infrastructure development, and increase network usage can provide a valuable foundation for implementing the 'Internet Plus' strategy. In addition, it should be noted that the use of the Internet has a more significant impact on household consumption in urban areas than in rural areas, so in the process of Internet development, we should not only focus on cities but also help people in rural areas to develop the Internet in a more inclined manner, to enrich the cultural life of people in rural areas, and also promote consumption.

6.3. Research limitations

The database used in this article comes from the China Family Tracking Survey (CFPS) database, which is implemented by the China Social Science Survey Center of Peking University and conducts a two-year survey and tracking. Up to now, the latest year of the survey database is 2018, so we use the survey samples of 2014, 2016, and 2018 to form empirical panel data. One of the study's limitations is that due to the limitation of data sources, the panel data is limited to a short period, and the survey data of the CFPS database is selected. Therefore, the next step is to collect longer-term survey data or use a complete micro-database of the Internet and household consumption data to examine the long-term trends in household consumption behavior changes in the era of rapid Internet development. On the other hand, the limitation of the study is that in the process of matching Internet usage and household consumption, this article adopts the method of financial decision-makers and spouses to conduct sample analysis. However, it is an improvement over the usual research method where individuals represent families but also indirectly ignores the influence of other family members on this study. In this way, the remaining characteristics of the entire family situation have not been fully considered, which may cause specific errors in the research conclusions. Therefore, the next step is to comprehensively integrate each family member's particular conditions to examine the Internet's impact on family consumption and select a more appropriate way to reflect the research object.

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ORCID

Yang Chunfang http://orcid.org/0000-0002-6498-434X
Zhang Yifeng http://orcid.org/0000-0002-4634-0903

Data availability statement

The submitted article appears all data, models, and code generated or used during the study.

Ethical statement

This article does not contain any studies with human participants or animals performed by any authors. I certify that this manuscript is original and has not been published, and will not

be submitted elsewhere for publication. And the study is not split up into several parts to increase the number of submissions and submitted to various journals or one journal over time.

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