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The Impact of Digital Economy Development on Residents' Consumption

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Abstract: In recent years, the digital economy's development has affected all aspects of society, of which residential consumption is a very important part. Currently, domestic research of the digital economy on consumption is on the rise, but most of the current research is theoretical analysis, lacking empirical results and related impact mechanisms. Based on the data of China Family Panel Studies (CFPS) in 2010 and 2014, this paper uses the "Broadband China" strategy released in 2013 as a natural experiment of the digital economy, and applies the difference-in-difference (DID) method to estimate the digital economy's impact on the consumption of residents. The study finds that the development of the digital economy has a significant positive effect on residents' consumption, mainly through three paths: social capital, human capital and income effect. The examination of heterogeneity reveals that the central region, urban residents, the middle and high education level, and the middle income group are the main beneficiaries of the digital economy's promotion of consumption, and the further study finds that the digital economy's impact on residents' consumption is concentrated on subsistence consumption.

Keywords: Digital Economy, Residential Consumption, Difference-in-difference, Mediating Effect.

1. Introduction

The digital economy's development is of great significance to the level of consumption of the population. Beyond the industrial and agricultural economy, the digital economy has become the main economic form, in which data resources are a key element. Utilizing current information networks, incorporating communication technology applications, and using the digital transformation of all components as a pivotal driving force, the speed of its development and the depth of its impact is promoting profound changes in the way of life, production and governance. China's core industries' added value from the digital economy accounted for 7.8% of the country's GDP in 2020. In the 14th Five-Year digital economy development plan China will further improve the governance system of the digital economy, and by 2025 will move towards a comprehensive expansion period, steadily improving the competitiveness and influence of China's digital economy. Undoubtedly, to achieve faster growth, a new driving force for China's economy is the digital economy. As one of the three main driving forces of the national economy, consumption is an important link in social reproduction. In the early days of reform and opening up, China's residents' consumption ability was low, and its contribution to economic growth was relatively small. With the vigorous development of network

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infrastructure in recent years, the rise of the digital economy has greatly boosted residents' consumption enthusiasm, and the contribution of consumption to the national economy has gradually increased. Therefore, the development of the digital economy's impact on residents' consumption is a worthy topic for in-depth study, furthermore this topic's research has certain practical significance as well, which can help the government and relevant departments to better formulate relevant policies to achieve sustainable economic growth in China.

In recent years, a number of theoretical and empirical studies have been conducted from the perspectives of Internet development and e-commerce on issues such as consumption level, urban-rural consumption gap, and consumption upgrading, finding a significant positive relationship between the two and providing detailed arguments for consumption-related issues. However, little literature has been written from the digital economy's perspective or verified the influence mechanism of the digital economy on residents' consumption. In this paper, we study the digital economy's impact on residents' consumption level, and the main questions of the study are: First, can the digital economy promote residents' consumption level? Second, what are the ways through which the digital economy affects the consumption level of residents? Third, what kind of impact does the digital economy's development have on the structure of residents' consumption?

In order to achieve the research objectives, this paper uses the "broadband China" policy as a natural experiment of the digital economy and analyzes the mechanisms related to the digital economy's impact on residents' consumption by using the DID regression method on panel data to test the proposed hypotheses. The following are this papers marginal contributions: (1) Unlike the findings of previous studies, the analysis of the data provided in this paper shows that the digital economy has the greatest impact on the central region and the middle-income group. (2) This paper tests three ways in which the digital economy promotes residents' consumption through the empirical results, which include social capital, human capital, and income effects, enriching the influence mechanism of the effect of the digital economy on residents' consumption. (3) This paper analyzes further how the digital economy impacts residents' consumption structure, and finds that in the early stage of the digital economy development, its impact on residents' consumption is mainly focused on subsistence consumption.

The main structure of the remainder of this paper is the following: section 2 will review the relevant literature and the relationship between them and presents the research hypotheses of this paper; section 3 describes the data sources, variables and constructs the regression model; section 4 provides the research results and conducts heterogeneity analysis; section 5 conducts robustness tests on the obtained results; section 6 conducts analysis for the impact mechanism; section 7 further studies the digital economy's impact on the consumption structure of residents; Section 8 concludes the research of this paper and gives corresponding policy recommendations.

2. Literature Review and Hypothesis Formulation

2.1. Literature Review

The digital economy has become a globalization trend, and although the leading strategies for the digital economy vary amongst major countries, the essence is to develop various information, communication and technology (ICT) enabling elements, such as digitalization, networking, and intellectualization. The digital economy was first proposed by Tepescott and others, but emerged as a phenomenal buzzword in China in 2007, and since 2008, the opportunities and challenges of the digital economy have become ubiquitous based on the popularity of mobile Internet. In this process, Internet companies in the upstream of technology application are the first to transform into digital enterprises [1]. There is some variation in the digital economy's current academic definition, and although there is no wide spread official definition of what is encompassed by it, it is widely accepted

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that innovation through digital technology has transformed many of the economy and life's aspects. Consumption, production, international trade, investment and the way financial transactions are conducted have all been altered by use technology [2]. Among them, the 2020 White Paper on China's Digital Economy Development released by the China Academy of Information and Communications Technology gives the definition for the digital economy that it is a new form of economic development and governance model that utilizes digital knowledge and information as key elements of production, digital technology as the primary driver, and modern day information networks as a pivotal carrier to continuously improve digitization, networking, and intellectualization through the extensive integration of the real economy and digital technology, and to accelerate the reconstruction of the economic form.

Current relevant domestic and international research on the digital economy is mainly concerned with the measurement of the level of the digital economy's development, the digital economy's drive on the transformation of traditional industries, and how the digital economy contributes to high-quality development. Brynjolfsson et al. (2019) propose that digital media take up an increasing share of our lives, but these goods and services are not counted in the GDP [3]. Since the benefits of digitalization are grossly underestimated, the decisions and policies made by policymakers by using GDP data are skewed from reality. They therefore propose a new alternative indicator, GDP-B, by quantifying how new free commodities contribute to consumer well-being, GDP-B complements the traditional GDP framework. reflecting the economic welfare gains from new free digital goods. Other scholars such as Strassner et al. and Barefoot et al. report that the U.S. Bureau of Economic Analysis (BEA) work on measuring the digital economy, including preliminary work on satellite accounts of the digital economy, and studies related to data processing and measurement, quantifying "free" digital media's value, etc [2,4]. Xu Xianchun et al. construct an accounting framework for the size of the digital economy through an international comparative perspective, define the scope of digital economy accounting, identify digital economy products, screen digital economy industries, measure the value added and total output of China's digital economy from 2007 to 2017, and compare the results with those of the United States and Australia, and conclude that the digital economy is a significant driver of economic growth [5]. The conclusion was that the digital economy has a significant role in driving economic growth.

Regarding the digital transformation of traditional industries, Xiao Xu et al. propose that digital technology's use has changed the traditional business logic and inserted new life into industrial development [6]. Specifically, the value dimensions of industrial digital transformation are reflected in four aspects: driving industrial efficiency enhancement, increasing cross-border integration of the industrial sector, enhancing industrial upgrading, and restructuring the competitive model of industrial organizations. Song et al. combine academic discussions on wholesale markets, e-commerce, and ecosystems with empirical results from a case study on a wholesale fruit market in Chongqing, China [7]. By investigating the outcomes and mechanisms of e-commerce, the dual utility of ICT adoption is shown for wholesale markets. On one side, marketing channel power and transaction costs may reduce the attractiveness of physical wholesale markets to customers and wholesalers. On the other side, network effects and innovation of business models can improve physical markets traditional wholesale advantages, which in turn can transform and upgrade traditional ecosystems into entrepreneurial ecosystems. Wen et al. measure industrial digitalization using intermediate inputs of ICT services and capital based on practical observations of industrial digital transformation and research the effect that industrial digitalization has on environmental performance of firms [8]. Industrial digitalization was found to have a considerable favorable effect on businesses' environmental performance, but it has an even greater effect on the COD emission intensity of businesses in highly polluting and non-capital intensive industries.

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Domestic and international scholars have explored theoretical and empirical links between the digital economy and quality development. For example, Stiroh attempts to find an empirical link between ICT capital accumulation and total factor productivity (TFP) growth in the US manufacturing sector, and the study claims that there is not much evidence that ICT capital is linked with significant TFP growth [9]. Strong evidence for the occurrence of spillover effects in the US economy is provided by Marsh et al., and suggests that ICT spillovers were one of the drivers of the U.S. productivity recovery in the 1990s [10]. In addition to ICT spillovers, Czernich et al. estimate the impact of broadband infrastructure on economic growth in OECD member countries from 1996-2007 [11]. The study found that after broadband is introduced in a country, GDP per capita on average became 2.7-3.9% higher than prior to the implementation of broadband. On the basis of sorting out the characteristics of China's digital economy development, Jing, Wenjun and Sun, Baowen found that the connection between economic growth and the digital economy as well as its built-in mechanism for encouraging high-quality economic growth are explored at two levels: micro and macro [12]. Among the macro level, the digital economy can increase economic growth through three paths, which are new input factors, resource allocation efficiency and total factor productivity.

Most of the current studies on consumption have examined the impact of Internet development or e-commerce on residents' consumption from the perspective of Internet development, which can be broadly classified into three aspects: consumption gaps, total consumption, and consumption upgrading. In a study related to the urban-rural consumption gap, Zhang Jie and Chen Lingyun argue that the rural e-commerce development’s effect on the gap in consumption among rural and urban residents will be transmitted through the direct and indirect effect of the income channel, which generally shows that it is beneficial to the reduction of the gap in consumption among rural and urban residents [13]. Li Jie and Xing Wei also conclude that the penetration of e-commerce on residents' consumption will promote rural residents' consumption more, and thus narrow the urban-rural consumption gap [14]. Li Lianmeng et al. concluded that the development of e-commerce in China from 2014-2018 did not shrink the consumption gap among rural and urban residents, but rather exacerbated it, mainly due to the lagging rural e-commerce infrastructure, urban-rural consumption characteristics and demographic differences [15]. li et al. based on generalized method of moments (GMM) estimation, which examined the effects of various socioeconomic variables on the per capita disposable expenditure ratios of urban and rural households between 1997 and 2014, concluded that the industrial structure of the secondary and tertiary sectors had less impact on the urban-rural consumption gap, suggesting that social welfare reforms (i.e., increasing education transfers in rural areas) may be more effective than manufacturing in reducing the urban-rural gap [16]. Zhang et al. find that digital finance helps increase household income in China, especially in rural areas [17]. Thus, digital finance facilitates inclusive growth in China by reducing regional and rural-urban disparities.

In terms of total consumption and household consumption, Lin, Xin et al. used a propensity matching score approach to study the impact of mobile Internet use on different consumption categories in rural households and found that mobile Internet use significantly boosted rural household consumption [18]. Chimere et al. investigated the macroeconomic determinants of household consumption in selected West African countries and empirically showed that domestic credit to the private sector and GDP per capita greatly enhanced household consumption [19]. By modeling racial consumption gaps across household income levels, Chénier et al. examine racial differences in total expenditures and expenditures on major goods and service categories (food, transportation, utilities, housing, health, and entertainment) and capture heterogeneous effects of racial stratification across classes [20].

Using data from the Chinese household survey, Yu analyses the dynamics of the distribution of consumption upgrading among rural Chinese households [21]. The findings demonstrate that rural families' convergence value is significantly higher than urban households', and that the gap between

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the two can be closed in the future. Feng Fusai, Wang Chen Yuan et al. empirically tested the synergistic development between the development of rural e-commerce and consumption upgrading in China, and concluded that rural e-commerce is conducive to promoting consumption upgrading [22-23].

Current studies on the digital economy's impact on residents' consumption are relatively few and most of them are theoretical. Lin Xiaoshan proposes that the new consumption has undergone systematic changes at the levels of consumption subject, consumption tool, consumption culture and consumption system based on the perspective of consumption revolution, among which the middle-income group is the backbone of the digital consumption revolution, and the digital consumption revolution has reshaped the daily life of the middle-income group, making digital life a new form of life [24]. Ma Xiangpin examines the residents' consumption changes in the digital economy's era through four aspects: trend, characteristics, mechanism and mode, and argues that the basic industries of digital economy and residents' consumption develop synergistically, and digital consumption gradually occupies the new high point of residents' consumption [25]. Ma Yue proposes that the mechanism of the digital economy influencing the consumer market is realized through three aspects: accelerating the digitization and intelligence of the production stage, reducing transaction costs and creating new consumer demand, and accelerating the transformation of residents' consumption concept and consumption behavior [26]. In addition, there is a lack of papers on the empirical evidence of the digital economy and residents' consumption, and the more relevant literature for this paper is Liu Daobo and Zhang Siqi based on the 2012-2018 CFPS data, regarded the "Broadband China" strategy as a quasi-natural experiment, and explored the impact of the digital economy on household consumption through the DID method [27]. The paper suggests that the digital economy can increase residents' income and thus promote their consumption growth.

In summary, it can be seen that previous studies on the impact of the digital economy on consumer consumption have been inadequate in terms of data support and empirical analysis. In contrast, this paper uses "broadband China" as a natural experiment to empirically analyze the impact of digital economy development on residents' consumption, and to examine and discuss the impact mechanisms. The findings of this paper can yield a theoretical basis for the research on the impact of digital economy on residents' consumption, and demonstrate its mediating effects in terms of social capital, human capital and income effects, as well as analyze the structural changes of residents' consumption, which can help fill the gaps in the existing literature on the research of digital economy on residents' consumption.

2.2. Hypothesis proposed

The digital economy has become an important key force for countries around the world to develop their economies, reshape their competitive advantages, and enhance their governance capabilities. Previous discussions regarding the relationship between consumption and the digital economy have been mainly from the perspective of e-commerce and mobile Internet, which provides inspiration for this paper. In this paper, we focus on the overall effect of the digital economy on consumption and the intermediate mechanisms, and analyze the possible mechanisms and results based on the existing research.

1. The impact of digital economy on consumer consumption. First of all, the digital economy's development can reduce consumers' search cost, expand the variety of available goods, and directly motivate consumers to purchase goods [28]. In the digital economy, networking and intellectualization have been greatly developed, and residents can consume through both online and offline methods. Online shopping is becoming a daily behavior of general residents [29]. Since the introduction of the concept of e-commerce in 1993, the current e-commerce is crossing over from the "development period" to the "prosperity period". The Ministry of Commerce's "Integrated E-

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Commerce Demonstration Counties in Rural Areas" project, launched in 2014, has also accelerated the economic development of rural areas. Internet-based e-commerce services have changed the price, variety, and quality of goods, saving consumers a lot of time and money in searching for information about goods and increasing the range of goods available, thus stimulating the growth of consumption. Second, the digital economy facilitates the matching of the supply and demand sides through the platform economy, and reduces the price of goods by reducing the links in the distribution of goods, thus providing equal access to online products for remote and poor people [30]. Since the prices of online goods and services are very competitive, online shopping saves residents' money and reduces transaction costs, thus making it easier and faster for them to consume [29]. In summary, the following hypotheses are obtained in this paper.

H1: The digital economy's development will contribute to an increase in residential consumption.

2. Heterogeneity of the digital economy on residents' consumption. China's dual structure of urban and rural areas, which is primarily manifested in the household registration system between urban and rural areas, the two resource allocation systems, and other issues under the household registration barrier system, is a major hindrance to the country's economic and social development. In contrast, urban areas are better developed than rural areas, and their transportation infrastructure and information infrastructure are more well developed, providing fertile soil for the development of the digital economy. There are certain differences in the consumption concepts of urban and rural residents, and the level of education and income among residents will have an impact on consumption. In addition, due to the unbalanced economic development between regions, the impact of the digital economy on residents in the east, central and western regions is also heterogeneous. Combining the above ideas, this paper proposes the following hypotheses.

H2: The digital economy will have different effects on the consumption of residents with different household registration, region, education level and income level.

3. The mechanism of the digital economy's influence on residents' consumption. As a traditionally relational society, social connections are highly prized in China's robust and enduring relational culture. Social networks are a major part of many Chinese people's life, and Ambrus et al. find that among individuals, social networks can serve as social collateral [31]. Yang et al. show that social networks have a significant positive effect on total household consumption, and that households with more social network resources will engage more actively in consumption [32]. The development of the digital economy has facilitated the rise of various social software, which not only enables e-commerce supply and demand sides to communicate and exchange anytime and anywhere, but also expands the social networks of residents. Consumption has a demonstration effect and is easily influenced by the surroundings. As the digital economy leads to the expansion of social networks, the demonstration effect of consumption is also expanding, which in turn promotes the growth of residents' consumption. Theories have shown that consumption depends not only on current income, but also on future income expectations. In the era of information scarcity, residents have limited access to information and more uncertainty about the future, so they are relatively conservative in consumption and less satisfied with their lives. With the advent of the information age, residents can obtain all kinds of information through the Internet, which reduces the degree of information asymmetry and enables them to better predict the direction of future development, and the uncertainty of the future gradually decreases. At the same time, residents are able to conduct online learning and training through the digital economy, making full use of various fragments of time to improve themselves and thus enhance their personal human capital. Through the improvement of human capital, residents' satisfaction with their lives will also increase, which in turn will lead to higher consumption levels. In addition, the popularity of the Internet has given rise to a large number of new businesses and new models, which bring more employment and entrepreneurial opportunities to the

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society and help to increase the income level of residents, and higher income will naturally lead to higher consumption level [27]. To sum up, this paper puts forward the following hypotheses.

H3: The digital economy will affect the level of consumption through social capital.

H4: The digital economy affects the level of consumption of the population through human capital.

H5: The digital economy affects the consumption level of the population through income effects.

3. Data sources, variable descriptions and basic models

3.1. Data sources

The data used in this paper comes from the 2010-2014 China Household Tracking Survey (CFPS), which was designed and tracked by the China Center for Scientific and Social Survey of Peking University, and aims to collect data at three levels: individual, household, and community, covering many aspects of Chinese society, demographics, economy, health, and education, and is very representative and authoritative. The sample of CFPS covers 25 provinces / municipalities / autonomous regions, whose population accounts for about 95% of the country's total population, so the sample of CFPS can be taken as a nationally representative sample. This paper's research is about the digital economy's impact on residents' consumption. Based on the research needs, we mainly use the household database of CFPS, while matching relevant data in the adult database to merge into panel data, and including heads of households with age ranging from 16 to 85 years old.

3.2. Variable Description

The "Broadband China" strategy's implementation plan, which lays out the development objectives and realization timelines for the following eight years in order to strengthen the pulling effect of broadband on the country's economy, was released by the Chinese State Council on August 17, 2013. In this paper, we use the "Broadband China" strategy introduced in 2013 as a quasi-natural experiment, and use it as a measure of the development of the digital economy to assess the impact of the development of the digital economy on residents' consumption using the DID method.

The correlative variables in this study are specified as follows.

3.2.1. Explanatory variable

The explanatory variable in this study is the level of consumption of the population, which is measured by summing the consumption expenditure of the population in the CFPS household pool.

Table 1: Variable descriptions.

Variables	Symbols	Description
Resident consumption level	Y	Total consumer spending
Development of the digital economy	Treat×Time	Internet access = 1, no Internet access = 0
Gender	gender	Male=1, Female=0
Age	age	Age of head of household
Marital Status	qe0	Married=1, Other=0
Years of Education	eduy_best	Years of education of the head of household
Is a member of the party	qa701	Party member=1, non-party member=0
Family housing area	fd2	Floor area of the current living room
Family size	familysize	Number of family members

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Household net income per capita	indinc_net	Adjusted net household income per capita
Household net worth	total_asset	Household net property values
GDP per capita	pgdp	From the statistical yearbook of each province
Number of general higher edu cation schools	heduc	From the statistical yearbook of each province
Parcel business volume	ppack	From the statistical yearbook of each province
Fiscal spending as a share of GDP	feratio	From the statistical yearbook of each province
Property income	fproperty	Measuring income effects
Ancestral rituals/grave clean ing	fc5	Measuring Social Capital
How satisfied you are with your life	qm403	Measuring Human Capital

3.2.2. Core explanatory variable

The development of the digital economy. The "Do you have Internet access" in the CFPS adult database is used as a measure of Internet use, with a value of 1 for "yes" and 0 for "no".

3.2.3. Control variables

With reference to available data and related studies, the control variables in this paper are selected at the individual, household, and regional levels. Among the control variables in the individual-level are: age, gender, years of education, marital status, and whether the household head is a party member. The control variables at the household level are household housing area, household size, household net income per capita, and household net worth. The control variables at the district level are GDP per capita, number of general higher education schools, parcel business, and fiscal expenditure as a share of GDP.

3.2.4. Mediator variables

There are three mediator variables in this study, namely income effect, social capital and human capital. The income effect is measured by "property income" in the CFPS household questionnaire, the social capital is measured by "whether or not to pay respect to ancestors/visit graves" in the CFPS household questionnaire, and the human capital is measured by "how satisfied you are with your life" in the CFPS adult questionnaire.

3.3. Basic model

To test the relevant hypotheses, the basic empirical analysis model between the digital economy and residential household consumption is set as a DID model.

$$Y_{it} = \alpha + \beta_1 Treat \times Time + \beta_2 Controls_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (1)$$

In equation (1), the subscript i denotes region, t denotes time, Controlsit are some individual and time-varying control variables, α is an intercept term, μi is an individual fixed effect, γt is a time fixed effect, and εit is a random error term. Where the coefficient β1 of Treat×Time is the coefficient to be estimated in this paper of interest.

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4. Empirical Analysis

4.1. The impact of the digital economy's development on residents' consumption

4.1.1. The impact on consumer spending

Shown on table 2 are the estimation results of the digital economy's impact on residential consumption. This paper first uses ordinary least squares to regress both the digital economy and residential consumption as model 1. Column (1) of Table 2 shows that the coefficient of the variable Treat×Time is significantly positive at the 1% level with a coefficient of 2.150, which tentatively determines that the development of the digital economy has a positive promotion effect on the level of residential consumption. In order to improve the accuracy of the model so as to achieve a higher degree of fitting, column (2) in Table 2 is a fixed utility model with individual-level and household-level control variables, and column (3) adds macro-level control variables on top of column (2). The regression results in column (3) show that every 1% increase in the digital economy will increase the consumption level of the population by 2.660%. The results for household housing area, household size, net household income per capita, net household property, provincial GDP per capita, and number of provincial general higher education schools are all significant. All control variables except net household income per capita have a significant positive effect on the level of consumption of the population. A negative coefficient of net household income per capita satisfies the law of diminishing marginal propensity to consume. Therefore, hypothesis 1 in this study is confirmed.

Table 2: Impact of the digital economy on residential consumption.

Variables	(1)	(2)	(3)
Treat×Time	2.150***	3.014***	2.660***
	(12.38)	(3.87)	(3.41)
fd2		0.014***	0.015***
		(6.33)	(6.70)
familysize		0.365**	0.396**
		(2.06)	(2.22)
indinc_net1		-0.143**	-0.152**
		(-2.23)	(-2.38)
total_asset1		0.014***	0.011***
		(3.61)	(2.83)
qa701		2.116	2.095
		(1.23)	(1.24)
gender		0.709	1.845
		(0.10)	(0.26)
age		0.583	0.733
		(0.31)	(0.40)
qe0		1.761	1.441
		(1.27)	(1.05)
eduy_best		0.180	0.177
		(0.74)	(0.74)
pgdp1			1.164***
			(2.61)
heduc			-0.066**
			(-2.20)

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ppack			-0.006
			(-1.10)
feratio			0.096
			(0.19)
2014.year	1.624***	0.388	-1.581
	(23.05)	(0.05)	(-0.21)
Constant	2.491***	-32.866	-36.836
	(64.60)	(-0.36)	(-0.41)
Observations	22,934	12,961	12,890
R-squared	0.18	0.31	0.33
Number of pid	17,875	12,389	12,320

Note: ***, **, * represent significant at the 1%, 5%, and 10% levels, respectively, and data in parentheses are t-statistics. Same as below

4.1.2. Heterogeneity analysis

Urban-rural heterogeneity. The regression analysis of this paper's sample into urban and rural areas shows a significant difference in the results, with columns (2) and (3) of Table 3 indicating that urban residents are more affected by digital economic development. Given the same other control variables, the impact of digital economic development on residents of rural areas is not significant, whereas the coefficient for urban residents is strongly positive at the 1% level. At the same time, the degree of impact of digital economic development on residents of different regions varies, with a greater effect on consumption promotion for urban residents. This phenomenon may be due to the fact that at the early stage of digital economy development, the development of transportation and network infrastructure in rural areas was not perfect, and their Internet development level was relatively backward compared to urban areas, so the digital economy level's impact on the rural residents' consumption was not great compared to that of urban residents.

Table 3: Results of the heterogeneity analysis of urban-rural and regional.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Total effect	Urban	Rural	East	Central	West
Treat×Time	2.660***	2.952***	1.817	2.201	2.487**	2.001
	(3.41)	(2.63)	(1.17)	(1.43)	(2.06)	(1.14)
fd2	0.015***	0.003	0.019**	0.025**	0.001	0.012
	(6.70)	(0.55)	-2.21	(2.49)	(0.39)	(1.56)
familysize	0.396**	0.701**	0.212	0.332**	0.624**	0.264
	(2.22)	(1.99)	(1.54)	(1.97)	(2.19)	(0.90)
indinc_net1	-0.152**	-0.115**	-0.670	0.131***	0.477	0.416
	(-2.38)	(-2.26)	(-1.04)	(-3.10)	(1.13)	(0.94)
total_asset1	0.011***	0.011*	0.018	0.009	0.030*	0.021
	(2.83)	(1.84)	(0.75)	(1.60)	(1.68)	(1.21)
qa701	2.095	2.485*	2.706	4.038**	0.049	4.463
	(1.24)	(1.67)	(1.17)	(2.37)	(0.04)	(1.45)
gender	1.845	2.540***			1.502	
	(0.26)	(3.26)			(1.24)	
age	0.733	0.890	0.181	0.439	-0.001	1.720
	(0.40)	(1.30)	(0.07)	(0.27)	(-0.00)	(1.34)

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qe0	1.441	-0.233	0.760	0.346	1.457	1.955
	(1.05)	(-0.13)	(0.54)	(0.12)	(1.56)	(0.75)
eduy_best	0.177	0.580*	0.023	0.404	0.143	0.189
	(0.74)	(1.75)	(0.10)	(1.26)	(0.81)	(0.69)
pgdp1	1.164***	0.390	3.582**	0.117	2.166*	5.232**
	(2.61)	(0.60)	(1.98)	(0.11)	(1.70)	(2.33)
heduc	-0.066**	-0.039	-0.109	-0.257	-0.046	0.061
	(-2.20)	(-0.75)	(-0.99)	(-1.15)	(-0.94)	(0.74)
ppack	-0.006	-0.010	0.002	-0.019*	0.020	0.212**
	(-1.10)	(-0.85)	(0.19)	(-1.90)	(1.20)	(2.45)
feratio	0.096	-72.030	29.823	-92.923	44.504	-55.561
	(0.19)	(-1.63)	(0.76)	(-1.42)	(0.98)	(-0.99)
2014.year	-1.581	0.333	-3.345	3.687	-1.014	-9.621
	(-0.21)	(0.11)	(-0.32)	(0.51)	(-0.09)	(-1.46)
Constant	-36.836	-29.787	-18.471	25.230	-17.841	-110.156
	(-0.41)	(-0.81)	(-0.15)	(0.30)	(-0.13)	(-1.58)
Observations	12,890	6,396	6,462	5,589	3,896	3,405
R-squared	0.33	0.39	0.32	0.46	0.32	0.33
Number of pid	12,320	6,148	6,201	5,389	3,700	3,235

Regional Heterogeneity. On the basis of the above benchmark regression in this paper, taking into account the specificity of the impact of different regional development levels on consumption, the regions in the sample are divided into east, central and west for group regression according to provincial codes with reference to previous studies. From the estimated results of different regions, the coefficients are positive overall, which indicates that the development of the digital economy has a certain promotion effect on the level of residents' consumption, but only the central region has significant results. The results in columns (4) to (6) of Table 3 show that the digital economy's development has a significant effect on the consumption level in the central region, with a positive coefficient at the 5% level, but a weaker effect in the western and eastern regions. The possible reason for this result is that there are some differences in the level of digital economy development, information infrastructure level and resource endowment between different regions. The eastern region is the more developed region in China, so its level of Internet development and infrastructure construction has been relatively high, compared with other regions, the development of its digital economy has also reached a high level, the level of consumption of residents is more stable, so in the same period of the digital economy-related policies on its residents' consumption is not very influential. The development level of the western region is more backward, and its network infrastructure is less perfect, so the development of the digital economy has less impact on it.

Education level heterogeneity. Columns (7) to (9) of Table 4 report the heterogeneous effects of the digital economy on residents' consumption with different levels of education. First, the household pool of 10-year "head of household" and 14-year "financial respondent" is defined as the head of household, and the individual pool is matched with the household pool. Then, the education level is classified according to the years of education of the household head, and less than 6 years is defined as low education level; 6 years and less than 9 years is defined as intermediate education level; 9 years and more is defined as high education level. From the regression results, it can be seen that the digital economy development has a better effect on the consumption promotion of residents with intermediate education level and high education level, and its coefficients are all significantly positive at the 5% level, with the effect of residents with intermediate education level significantly greater

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than that of residents with high education level and low education level. The effect of digital economy on the consumption of residents with less than 6 years of education is not significant. The possible reason for this is that residents with lower education levels are also less educated and therefore less likely to use electronic products such as cell phones or computers, and less likely to consume through the Internet. The development of the digital economy mainly lies in the development of the information industry such as the Internet, so it has less impact on residents with less years of education who are less likely to access the Internet.

Income level heterogeneity. The income in the sample was divided into five parts according to the income quintiles, which include low, middle, and high income level. The middle income level was further divided into three levels: low, middle, and high. Regression analysis was conducted for each of these five subgroups, and the results are shown in columns (10) to (14) of Table 4. Different income levels regression results show that the middle-income group is more affected by the digital economy, with the coefficients of low and high income in the middle-income level being significantly positive at the 1% level and the coefficient of middle income in the middle-income level being significantly positive at the 5% level. As the level of development of the digital economy increases, the consumption level of the middle income group increases to a greater extent than other groups. The coefficient of digital economy development for lower income levels is negative and insignificant, indicating that the digital economy's development has almost no effect on the consumption behavior of low income residents. It has been previously demonstrated in the literature that low income levels search for cheaper consumer goods through the use of the Internet, and therefore do not increase the total consumption amount and have lower consumption demand. Moreover, the empirical results of this paper confirm that the middle-income group is the backbone of the digital consumption revolution, which in turn has reshaped the daily life of the middle-income group.

Table 4: Results of heterogeneity analysis of education level and income level.

	(7)	(8)	(9)
Variables	Low level	Intermediate level	High level
Treat×Time	1.192	7.155**	2.106**
	(0.96)	(2.47)	(2.27)
fd2	0.008	0.020***	0.010
	(1.11)	(4.46)	(1.22)
familysize	0.254	0.954***	0.339**
	(0.42)	(2.64)	(2.06)
indinc_net1	0.644	-1.421***	-0.116**
	(1.26)	(-2.59)	(-2.15)
total_asset1	0.024	0.016	0.011
	(1.54)	(1.46)	(1.61)
qa701	3.800*	4.953**	2.236
	(1.90)	(2.03)	(1.57)
gender		3.601**	
		(2.47)	
age	4.474***	0.627	0.254
	(3.04)	(0.63)	(0.13)
qe0	-0.600	2.194	1.956
	(-0.55)	(1.34)	(1.23)
eduy_best			

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pgdp1	1.240	3.261**	0.720
	(0.88)	(2.31)	(1.48)
heduc	0.063*	-0.147**	-0.080
	(1.72)	(-2.25)	(-1.08)
ppack	0.011	0.012	-0.008
	(0.82)	(1.23)	(-0.84)
feratio	-21.879	19.881	-0.120
	(-0.38)	(0.38)	(-0.69)
2014.year	-17.924**	-2.422	1.567
	(-2.56)	(-0.54)	(0.20)
Constant	-253.684***	-43.656	-5.941
	(-2.94)	(-0.84)	(-0.07)
Observations	2,889	3,018	6,983
R-squared	0.31	0.63	0.31
Number of pid	2,801	2,898	6,662

	(10)	(11)	(12)	(13)	(14)
Variables	Low	Middle low	Middle middle	Middle high	High
Treat×Time	-0.487	2.102***	3.311**	6.583***	1.219
	(-0.55)	(2.66)	(2.04)	(4.49)	(0.54)
fd2	0.001	-0.001	0.020*	-0.012**	-0.014
	(0.56)	(-0.43)	(1.65)	(-2.28)	(-1.04)
familysize	0.177	0.087	0.443	0.414	1.953*
	(1.63)	(0.42)	(0.26)	(0.80)	(1.88)
indinc_net1	-2.689	9.232**	-1.714	-0.205	-0.135**
	(-1.07)	(2.54)	(-0.62)	(-0.08)	(-2.13)
total_asset1	0.019	0.016	0.009	0.075***	0.010
	(1.16)	(0.86)	(0.42)	(3.27)	(1.25)
qa701		-0.493	-3.269		2.753
		(-0.33)	(-0.90)		(1.09)
gender	-1.371				
	(-0.46)				
age	1.567**	-10.337***	-0.514	-2.545	2.453
	(2.13)	(-14.08)	(-0.39)	(-0.66)	(1.42)
qe0		1.682	2.375	6.742***	0.278
		(1.55)	(0.89)	(3.92)	(0.09)
eduy_best	0.363	-0.282**		-0.608	1.905
	(0.64)	(-2.18)		(-1.33)	(1.26)
pgdp1	-4.445*	0.675	4.171	2.955	0.372
	(-1.84)	(0.76)	(1.34)	(1.02)	(0.12)
heduc	0.027	-0.002	-0.094	0.021	-0.128*
	(0.82)	(-0.05)	(-1.55)	(0.23)	(-1.66)
ppack	-0.032**	0.002	0.041	0.015	-0.035
	(-2.05)	(0.24)	(1.33)	(0.83)	(-1.14)
feratio	-13.159	-172.772**	-29.680	96.912	-330.274*

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	(-0.41)	(-2.38)	(-0.32)	(1.50)	(-1.68)
2014.year		44.067***		4.811	
		(10.38)		(0.31)	
Constant	-60.366**	536.038***	13.697	84.799	-41.056
	(-2.33)	(12.20)	(0.37)	(0.45)	(-0.99)
Observations	2,732	3,017	2,778	2,186	2,177
R-squared	0.74	0.82	0.66	0.89	0.54
Number of pid	2,707	2,987	2,749	2,168	2,125

5. Robustness tests

5.1. Parallel trend test

The use of the DID method presupposes that the target variables in the treatment and control groups satisfy the parallel trend assumption before the occurrence of the policy. Otherwise, if there is some difference between the two before the policy occurs, the Treat×Time result may no longer accurately represent the net effect of the policy in question, when the change in the explanatory variable is sensitive to other factors. The mean values of the explanatory variables' residential consumption levels are first generated, and then the time trend is plotted according to the year and whether it is a treatment group, and the results are shown in Figure 1 below. It can be seen from the graph that before 2013, the treatment and control groups as a whole maintain the same growth trend. After 2013, consumer spending continues to rise, but the gap between the treatment and control groups gradually widens compared to 2010. Therefore, the figure shows that the time trend assumptions between the two groups are basically satisfied in the years before the implementation of the policy, and the difference between the treatment and control groups after 2013 is mainly due to the implementation of the "Broadband China" policy in 2013.

5.2. Substitution of variables

In order to further verify the robustness of the experimental results, this paper regresses the values of the explanatory variables resident consumption level and the macro control variables provincial GDP per capita, number of general higher education schools, and parcel business volume without any unit shift, but after taking ln values. The results are shown in Table 5 below. The coefficient of Treat×Time is still significantly positive at the 5% level after taking ln values for the main variables in the model, and the results confirm that the digital economy's development can promote the increase in the level of residents' consumption.

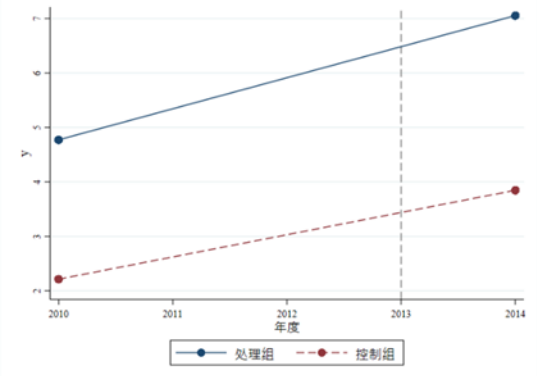

Figure 1: Time trend graph.

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Table 5: Regression results after replacing variables.

	(1)
Variables	lny
Treat×Time	0.225**
	(2.11)
fd2	0.000
	(1.18)
familysize	0.089***
	(3.64)
lnindinc_net	0.105***
	(3.32)
lntotal_asset	0.052**
	(2.01)
qa701	0.380
	(1.57)
gender	-0.518
	(-0.55)
age	-0.193
	(-0.79)
qe0	0.322*
	(1.68)
eduy_best	0.025
	(0.76)
lnppack	-0.249
	(-0.83)
lnpgdp	-0.039
	(-0.09)
feratio	-0.150
	(-0.72)
lnheduc	-0.692*
	(-1.68)
2014.year	1.487
	(1.47)
Constant	22.072*
	(1.69)
Observations	12,499
Number of pid	11,988
R-squared	0.46

5.3. PSM-DID test

In order to do away with the problem of possible selectivity bias, the propensity score matching method (PSM) is used in this paper for testing. Nearest neighbor matching, kernel matching, and local linear regression matching, followed by DID regression, were adopted, respectively, and the results are shown in Table 6 below. The estimated coefficients, signs, and significance levels of the core explanatory variables under the three matching methods are similar to the benchmark results, and the

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coefficients of Treat×Time are significantly positive at the 1% and 5% levels, further indicating the robustness of the results in this paper.

Table 6: PSM-DID results.

	(1)	(2)	(3)
Variables	y1	y1	y1
Treat×Time	3.243**	2.562***	2.301**
	(2.58)	(3.02)	(2.55)
time	6.419		
	(0.62)		
treat	-1.667		
	(-1.22)		
fd2	0.023***	0.015**	0.023***
	(6.69)	(2.30)	(2.69)
familysize	1.165***	0.660***	1.211***
	(2.85)	(3.13)	(3.37)
indinc_net1	-0.241	-0.126	-0.210
	(-0.78)	(-0.27)	(-0.44)
total_asset1	0.007	0.010	0.008
	(1.39)	(1.63)	(1.12)
qa701	0.228	1.736	0.279
	(0.10)	(1.39)	(0.17)
gender	-	1.884***	
		(3.03)	
age	-1.034	0.194	0.547*
	(-0.40)	(0.21)	(1.73)
qe0	0.687	1.235	0.992
	(0.36)	(1.11)	(0.64)
eduy_best	0.478	0.244	0.448
	(1.03)	(1.49)	(1.42)
pgdp1	0.854	1.247**	0.946
	(1.50)	(2.07)	(1.51)
heduc	-0.088**	-0.072	-0.083
	(-2.12)	(-1.34)	(-1.09)
ppack	0.006	-0.004	0.006
	(0.76)	(-0.64)	(0.56)
feratio	0.354	0.188	0.390
	(0.62)	(0.89)	(1.53)
2014o.year	-	0.585	
		(0.16)	
Constant	-8.358	-11.763	-28.993**
	(-0.09)	(-0.27)	(-2.52)
Observations	11,835	11,835	6,894
R-squared	0.33	0.33	0.39
Number of pid	11,301	11,301	6,587

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6. Mechanism Analysis

6.1. Social Capital

With the rise of social economics in recent years, social relations and social structural factors have been gradually incorporated into the framework of mainstream economics, resulting in the concept of "social capital". Social network social capital refers to the connection between people, and it is commonly found in interpersonal relationships. Social networks are an important expression of social capital and have a strong economic effect. Residents' consumption preferences as well as perceptions are easily influenced by people around them. Previously, related literature has studied the relevant influence of social networks on residents' consumption, and under the digital economy's development, the transmission of information is faster, more convenient and lower cost, and residents' consumption shows a more obvious demonstration effect. In this paper, with reference to related studies, we adopt the questionnaire of CFPS "whether to pay respect to ancestors and visit graves" (fc5) to measure social networks. The following table reports the results of the mediating effects of social capital, human capital and income effects on residents' consumption. Columns (1) to (3) of Table 7 show that the regression results of Treat×Time for social network are significant, and the coefficient of Treat×Time decreases significantly after adding social network to the benchmark regression, which indicates that the mediating effect of social network holds. A part of the positive promotion impact of the digital economy's development on the consumption level of residents is influenced by social networks.

Table 7: Results of impact mechanisms.

	(1)	(2)	(3)
Variables	y1	fc5	y1
Treat×Time	2.660***	0.168***	1.574***
	(3.20)	(2.84)	(7.21)
fd2	0.015**	0.000*	
	(2.21)	(1.69)	
familysize	0.396**	-0.006	0.453***
	(2.28)	(-0.47)	(7.91)
indinc_net1	-0.152***	-0.001	0.029
	(-3.18)	(-0.58)	(0.40)
total_asset1	0.011*	0.000	0.011***
	(1.85)	(0.06)	(3.96)
qa701	2.095*	0.127	1.092**
	(1.77)	(1.11)	(1.97)
gender	1.845***	-0.045	0.591
	(2.86)	(-1.23)	(1.01)
age	0.733	0.302***	-0.564
	(0.77)	(2.74)	(-1.20)
qe0	1.441	0.050	0.050
	(1.37)	(0.47)	(0.17)
eduy_best	0.177	0.017	0.028
	(1.18)	(0.84)	(0.82)
pgdp1	1.164**	0.058	0.552***

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	(2.13)	(1.44)	(3.69)
heduc	-0.066	-0.001	-0.013
	(-1.32)	(-0.53)	(-1.51)
ppack	-0.006	-0.000	-0.000
	(-0.90)	(-0.91)	(-0.20)

6.2. Human Capital

Human capital is the capital embodied in workers, which is expressed in their relevant knowledge and skills, cultural and technical levels, etc. In the process of economic growth, the role of human capital is greater than that of physical capital. With the popularity of the Internet, people have easier access to all kinds of information, thus reducing the degree of information asymmetry in society; simultaneously, it provides a platform as well for residents to use the Internet to continuously learn and thus improve their relevant knowledge and skills. In a period of information scarcity, the future is highly uncertain and residents are relatively conservative in their consumption. In the process of digital economy development, residents' expectation of future uncertainty slowly decreases, and the digital dividend makes residents' life more convenient, so their satisfaction with life is also increasing, and their consumption habits will gradually change. In this paper, the human capital (qm403) is expressed by "how satisfied you are with your life" in the CFPS questionnaire. Columns (4) to (6) in Table 8 below show that the significance level of Treat×Time does not change after adding the human capital variable, but the coefficient decreases from 2.660 to 1.630 , verifying the mediating effect of human capital, and the hypothesis of this study is supported.

6.3. Income effect

Disposable income per capita is the main source of consumption and one of the key factors determining consumption growth. Ma Xiangpin points out that, on the one hand, as the digital economy permeates deeply into all areas of society, it expands the scale and quality of employment of residents, and as a result, the income structure of residents is adjusted; on the other hand, the digital economy’s newly generated business models and the adjustment of the income structure further lead to the continuous changes and development of consumption behavior, perceptions and environment [25]. This paper finds that fproperty1 plays a part in the mediating effect of the digital economy in promoting consumption. As a part of the disposable income of residents, property income is not very high but is important for the development of national economy. Columns (8) and (9) display the digital economy’s development has a significant positive impact on property income, and the coefficient decreases significantly after adding property income to the benchmark regression, thus the mediating effect of property income is verified.

Table 9: Results of impact mechanism analysis.

	(4)	(5)	(6)
Variables	y1	qm403	y1
Treat×Time	2.660***	-0.233*	1.630***
	(3.20)	(-1.90)	(7.58)
fd2	0.015**	-0.000	
	(2.21)	(-0.29)	
familysize	0.396**	0.062**	0.452***
	(2.28)	(2.41)	(7.85)
indinc_net1	-0.152***	-0.007	0.031

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	(-3.18)	(-0.77)	(0.43)
total_asset1	0.011*	0.001**	0.011***
	(1.85)	(2.15)	(3.92)
qa701	2.095*	0.079	1.134**
	(1.77)	(0.34)	(2.03)
gender	1.845***	-1.645***	0.576
	(2.86)	(-18.78)	(1.05)
age	0.733	-0.042	-0.088
	(0.77)	(-0.10)	(-0.53)
qe0	1.441	0.422*	0.038
	(1.37)	(1.80)	(0.13)
eduy_best	0.177	-0.020	0.031
	(1.18)	(-0.35)	(0.92)
pgdp1	1.164**	0.002	0.588***
	(2.13)	(0.03)	(3.88)
heduc	-0.066	-0.004	-0.013
	(-1.32)	(-0.91)	(-1.51)
ppack	-0.006	0.001	-0.000
	(-0.90)	(0.69)	(-0.29)
feratio	0.096	0.126***	0.127**
	(0.51)	(5.32)	(2.33)
2014.year	-1.581	0.567	1.103
	(-0.41)	(0.32)	(1.63)
qm403			0.073
			(1.50)
Constant	-36.836	6.353	3.091
	(-0.79)	(0.30)	(0.39)
Observations	12,890	12,877	22,686
R-squared	0.33	0.10	0.22
Number of pid	12,320	12,307	17,690

	(7)	(8)	(9)
Variables	y1	fproperty1	y1
Treat×Time	2.660***	0.128**	1.632***
	(3.20)	(2.03)	(7.58)
fd2	0.015**	0.000	
	(2.21)	(1.00)	
familysize	0.396**	0.005	0.452***
	(2.28)	(0.82)	(7.89)
indinc_net1	-0.152***	0.010	0.028
	(-3.18)	(0.87)	(0.38)
total_asset1	0.011*	0.001***	0.010***
	(1.85)	(2.94)	(3.67)
qa701	2.095*	-0.138	1.139**
	(1.77)	(-0.67)	(2.05)
gender	1.845***	-0.039	0.588

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	(2.86)	(-0.70)	(1.01)
age	0.733	-0.085	-0.080
	(0.77)	(-1.13)	(-0.48)
qe0	1.441	0.014	0.049
	(1.37)	(0.48)	(0.16)
eduy_best	0.177	-0.016	0.030
	(1.18)	(-1.07)	(0.90)
pgdp1	1.164**	0.000	0.580***
	(2.13)	(0.02)	(3.86)
heduc	-0.066	0.000	-0.013
	(-1.32)	(0.14)	(-1.53)
ppack	-0.006	-0.000	-0.000
	(-0.90)	(-0.93)	(-0.22)
feratio	0.096	0.004	0.134**
	(0.51)	(0.65)	(2.48)
2014.year	-1.581	0.292	1.104
	(-0.41)	(0.98)	(1.63)
fproperty1			0.166
			(1.03)
Constant	-36.836	4.338	2.943
	(-0.79)	(1.17)	(0.37)
Observations	12,890	12,890	22,708
R-squared	0.33	0.12	0.22
Number of pid	12,320	12,320	17,702

7. Further research on the impact of digital economy development on the consumption structure of residents

In the CFPS database, consumer spending is divided into eight categories, including food spending, clothing spending, housing spending, household equipment and daily necessities spending, transportation and communication spending, education and entertainment spending, health care spending, and other consumer spending. Therefore, this paper further analyzes the impact of the digital economy on residents' consumption structure. Table 9 below reports the impact of the digital economy on the eight major categories of consumer spending. Unlike the synchronization of the traditional consumption influencing factors on the various types of consumption and total consumption, the impact of the digital economy's development on the residents' consumption structure shows differences.

The development of the digital economy significantly increases food, clothing, housing, and education and entertainment expenditures, and decreases health care and other consumer expenditures, but does not have a significant effect on either of them. The regression results show that the coefficients of the digital economy on food, clothing, housing, and education and entertainment expenditures are significantly positive. The coefficient of the digital economy is 1.102 at the 10% level, indicating that for every 1% increase in the development of the digital economy, the local residential consumption will be increased by 1.102%; the coefficient of the digital economy is 0.775 at the 1% level. This shows that the digital economy primarily affects household consumption through food expenditure, clothing expenditure, housing expenditure, and cultural, educational and entertainment expenditure, while the development of the digital economy does not have a significant

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impact on household daily necessities and equipment expenditure, transportation and communication expenditure, health care expenditure, and other consumer expenditure.

Most scholars classify household consumption expenditure into two categories: subsistence consumption and development and enjoyment consumption, where subsistence consumption includes clothing, food and housing. Development and enjoyment consumption includes daily necessities, health care, transportation and communication, culture, education and entertainment, and other consumption. According to the regression results in the table below, it can be seen that in the early stage of the development of the digital economy, its impact on residents' consumption is mainly focused on subsistence consumption.

The implementation of the "Broadband China" policy has led to the rapid development of China's information infrastructure through the construction of network infrastructure to improve network transmission rates and network coverage, thus promoting the development of national informatization and digitalization. In terms of food spending, thanks to the development of the Internet, residents can buy the food they need on the Internet, and their prices are often better than those in brick-and-mortar stores. And the improvement of logistics and other infrastructure construction also makes it possible for some fresh food to be distributed over long distances, providing residents with more convenient services. In the information age, residents can search through the Internet to easily get more information they need, which largely overcomes the previous information asymmetry problem, and there are more cheap and high-quality choices in the process of consumption, expanding the range of choices available to residents. The development of the digital economy has significantly influenced residents' spending on food, clothing, housing, and education and entertainment, as online consumption gives them more choices than the previous offline shopping model. This paper concludes that, unlike some other studies, the Internet has a limited effect on the promotion of subsistence consumption such as food and housing, and this result may be due to the difference in the use of data. This paper uses data from 2012 and 2014, the years before and after the implementation of the "Broadband China" policy, to better verify the impact of the early development of the digital economy on residents' consumption under this policy. In addition, unlike the cross-sectional data used in some papers, the author matches the principal and financial respondent IDs in the CFPS household database with the information in the adult database and merges them into the panel data. The panel data provide information on people's dynamic behavior as compared to cross-sectional data, and the two dimensions considerably enhance the panel sample size, which definitely increases estimation precision.

Table 9: Results of further analysis.

	(1)	(2)	(3)	(4)
Variables	food1	dress1	house1	daily1
Treat×Time	0.775***	0.194**	1.102*	0.472
	(5.09)	(2.37)	(1.66)	(1.36)
fd2	0.000	0.000	0.006**	0.008
	(0.79)	(0.43)	(2.01)	(1.32)
familysize	0.134**	0.022**	0.022	0.128
	(2.48)	(2.40)	(0.27)	(1.56)
indinc_net1	-0.010	-0.011	-0.076**	-0.028
	(-0.73)	(-1.17)	(-2.31)	(-0.74)
total_asset1	0.003***	0.001	0.008	-0.004
	(4.07)	(1.11)	(1.59)	(-1.14)
qa701	0.145	0.136	0.506	1.007

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	(0.38)	(0.95)	(0.78)	(1.37)
gender	0.781***	0.151**	1.104**	0.399
	(8.23)	(2.50)	(1.97)	(0.89)
age	-0.065	0.047	0.405	0.332
	(-0.30)	(0.71)	(0.46)	(0.90)
qe0	-0.182	0.092	0.416	0.050
	(-0.33)	(0.92)	(0.85)	(0.22)
eduy_best	-0.021	0.012	0.194*	0.003
	(-0.64)	(1.29)	(1.85)	(0.06)
pgdp1	0.182*	0.123	-0.603	0.616
	(1.67)	(1.45)	(-1.08)	(1.52)
heduc	-0.001	0.002	-0.078	-0.013
	(-0.20)	(0.81)	(-1.36)	(-0.64)
ppack	-0.001	-0.001	0.007	-0.004*
	(-1.49)	(-1.43)	(0.93)	(-1.65)
finrev1	0.326	-0.347	4.467	0.151
	(0.70)	(-1.19)	(1.55)	(0.11)
2014.year	0.382	-0.224	0.445	-1.953
	(0.43)	(-0.72)	(0.13)	(-1.25)
Constant	2.963	-2.737	-17.541	-17.261
	(0.27)	(-0.82)	(-0.40)	(-0.95)
Observations	12,865	12,865	12,865	12,865
R-squared	0.35	0.15	0.18	0.18
Number of pid	12,299	12,299	12,299	12,299

	(5)	(6)	(7)	(8)
Variables	med1	trco1	eec1	other1
Treat×Time	-0.027	0.068	0.211*	-0.027
	(-0.20)	(1.18)	(1.66)	(-0.17)
fd2	0.000	-0.000	0.000	0.000
	(0.61)	(-0.33)	(0.98)	(1.45)
familysize	0.006	0.024*	0.053**	0.025*
	(0.20)	(1.93)	(2.34)	(1.95)
indinc_net1	0.005	0.006	-0.005	-0.027*
	(0.94)	(1.25)	(-0.87)	(-1.87)
total_asset1	-0.001	0.001	0.003***	0.001**
	(-1.02)	(1.56)	(3.84)	(2.15)
qa701	0.155	0.125	-0.042	0.260*
	(0.76)	(1.05)	(-0.19)	(1.87)
gender	-1.227***	0.170***	0.091	-0.011
	(-10.43)	(3.41)	(1.35)	(-0.20)
age	-0.223	-0.011	0.201	-0.100
	(-1.18)	(-0.12)	(1.32)	(-1.33)
qe0	0.578	0.312**	0.103	-0.026
	(1.29)	(2.16)	(0.73)	(-0.50)

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eduy_best	-0.034	0.007	-0.003	0.027
	(-1.21)	(0.63)	(-0.19)	(0.76)
pgdp1	-0.119	0.031	0.100*	0.036
	(-1.21)	(0.64)	(1.66)	(0.72)
heduc	-0.006	-0.004	0.004	-0.003
	(-1.31)	(-1.18)	(0.83)	(-0.74)
ppack	0.001	-0.000	-0.001	0.000
	(0.72)	(-0.63)	(-1.26)	(0.22)
finrev1	0.372	0.138	-0.235	0.229
	(0.99)	(0.58)	(-0.85)	(1.22)
2014.year	1.071	0.094	-0.898	0.272
	(1.40)	(0.27)	(-1.44)	(0.92)
Constant	12.476	0.626	-10.349	4.779
	(1.32)	(0.15)	(-1.37)	(1.28)
Observations	12,865	12,865	12,865	12,865
R-squared	0.03	0.13	0.12	0.05
Number of pid	12,299	12,299	12,299	12,299

8. Conclusion and Discussion

Using panel data from the China Family Panel Studies (CFPS) for 2010 and 2014, this study empirically tests the overall effect of the digital economy's development on residents' consumption and the specific impact mechanism using the DID method, and robustness checks are conducted on the results. The findings are as follows: First, the digital economy's development can significantly and positively promote the consumption of residents. According to the regression results, every 1% increase in the digital economy's development can lead to a 2.66% increase in residential consumption. And the impact of the digital economy on the consumption of residents is significantly heterogeneous. At the urban and rural levels, the impact of the digital economy's development on consumption of urban households is more significant than that of rural households. In terms of education level, the coefficients of intermediate education level and high education level are significantly higher than those of low education level, in which every 1% increase in the development level of the digital economy can promote 7.155% increase in consumption of the intermediate education group; in terms of income level, the digital economy's development has a significantly higher impact on middle income level households than low and high income households.

In addition, by analyzing the mechanism of the impact of digital economy development on the consumption of residents, we find that the digital economy can promote residents' consumption through three aspects: social capital, human capital, and income effect, and this empirical result provides the most direct evidence that the digital economy boosts residents' consumption. Finally, the regressions on food, clothing, housing, daily necessities and household equipment, transportation and communication, culture, education and entertainment, health care, and other consumer spending reveal the differences in the effects of the digital economy on different consumptions. The impact of digital economy on food expenditure, clothing expenditure, housing expenditure and cultural, educational and entertainment expenditure is significantly positive, with the largest coefficient for housing expenditure, indicating that the development of the digital economy mainly expands residents' consumption level through the above four types of consumption.

Based on the above research findings, this paper obtains the following policy insights: first, further strengthen the construction of relevant network and information infrastructure in rural areas, and lay out 5G, Internet of Things, artificial intelligence and other facilities in rural areas to build the

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development foundation of the digital countryside. At the same time, the logistics environment in rural areas should be improved, and the construction of modern commodity distribution channels should be promoted to enhance the consumption level in rural areas and narrow the consumption gap between urban and rural areas. Second, the government should avoid a one-size-fits-all approach when formulating relevant digital policies. For different regions, appropriate approaches should be developed according to regional factor endowments and economic development levels, especially to increase investment in "new infrastructure" in western regions to increase the income and employment opportunities of local residents, thus boosting consumption growth and narrowing the data divide. Meanwhile, this study confirms that the digital economy has a significant positive impact on the consumption of middle-income and intermediate- and highly-educated people, and that the policy-making process should also focus on the consumption needs and interests of low-income and low-educated people, so as to fully release the consumption potential of these people. Finally, although the empirical results show that the digital economy's impact on consumption is mainly focused on subsistence consumption, on the other hand, it also shows that there is still more room for the development and enjoyment of the digital economy to boost consumption. Government departments should actively promote the promotion of the digital economy for various consumptions, promote the deep integration of "Internet+" with medical, transportation and other consumption industries, further build China's digital service system based on digital infrastructure, improve the level of public services, and enhance the quality of residents' consumption.

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