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The impact of the digital economy on young people's consumption in the context of the new coronary pneumonia epidemic

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ABSTRACT

This paper analyzes digital economy data from Beijing and 1 Chinese province and city by a panel model and a fixed impact model. The findings are as follows: First, the development of digital participatory finance has positively influenced China's consumption level, consumption structure, consumption areas and development, mainly because it has affected the consumer goods of Chinese citizens. Second, by analyzing digital economy indicators and data at different stages of economic development, it is believed that the size and reach of the digital economy will have a more positive impact on per capita consumption in China. China's digital economy mainly affects the urban-rural structure, regional structure, and consumption habits of residents to realize the impact of the digital economy. The digital economy has a much greater impact on growth-oriented household consumption than on household consumption. Based on the findings, recommendations for action are also provided. The government should strengthen digital infrastructure, improve digital economy products and derivative financial services, improve the quality of current financial services for citizens, and increase the affordability of citizens to successfully develop the digital economy.

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1. Introduction

As the epidemic spreads, the digital economy is increasingly penetrating into ordinary households. Over time, new business models have emerged, such as contactless delivery, online registration, and online healthcare. With the decline of tourism, young people are more interested in e-commerce. The convenience and diversity of online consumption has led to an increasing number of leisure users using online consumption of products and services. By 2 years, total sales of consumer goods in China will reach 44.1 trillion yuan and turnover will exceed 12.8 trillion yuan, accounting for 29% of total consumption (Aydin, 2022). The share of e-commerce consumption

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continues to grow. In 2021, China's total retail sales will reach 3 trillion yuan, an increase of 14.1% year-on-year. The trend towards digital and integrated consumption is also becoming more evident as prevention moves into its normal phase. This study examines the impact of the digital economy on the coronavirus pneumonia epidemic, based on research and analysis of the current consumption of young Chinese households.

Population consumption not only contributes to China's economic growth, but is also an important way to address major issues such as employment difficulties, industrial upgrading, and demographic change. In 2010, China's household consumption fell from 47% to less than 36%, ranking first among 12 economies in the world. The 19th Conference Report. 2017, the National Congress of the Communist Party of China emphasized that China needs to improve and promote an appropriate consumption system. To strengthen the leading role of consumption in economic development and establish a consumption system to promote the internal circulation of the Chinese economy. The impact and promotion of consumption on China's economic development will gradually increase, and gradually improving basic household consumption activities is an important way to give full play to the fundamental role of household consumption behavior and promote China's economic and social development. This is also a choice and a new feature of China's social and economic development in the new period. In examining China's consumption factors, we need to seriously study and explore the determinants of China's consumption in order to achieve moderate consumption-led economic growth.

In this context, the rapid development of China's digital economy is refreshing. According to 2020 statistics, retail sales of natural products in China were $852 million. The RMB M1 currency grew by around 20% last year. Especially since the coronavirus pandemic in 2019, China's digital economy has grown rapidly and the consumer sector is very active. It plays a stable role in protecting and promoting the consumption of the population and in keeping the economy functioning properly and efficiently. With the rapid development of the digital economy, the digital economy is also emerging and evolving. In the context of China's socialist market economy, household consumption is the most important factor in revitalizing the economy, improving capital flows, and keeping the economic system healthy. With the accelerated growth of the national economy and the continuous optimization of various industrial structures, the role of household consumption in the development of China's new economy is becoming more and more obvious. Second, compared with the traditional financial economy, the digital economy provides society with a variety of convenient financial services, such as e-commerce and digital economy management, which effectively contribute to people's economic inclusion and daily life. After all, corporate financial services in the digital economy have been adapted to all levels of the economy and society. Most of them are low-income groups, as potential residents of this group are more likely to consume and have reduced credit constraints due to their increased affordability and precautionary restrictions on the incentive to save, which may lead to a sharp decline in consumer demand. This paper analyzes in detail the impact of the development of the digital economy on household consumption in China.

Theoretically, consumption is an important area of macroeconomic research, and the study of factors affecting household consumption has been at the core of economic research.

Based on widely cited literature, journals, and references, this paper analyzes the impact of the digital economy on household consumption and suggests ways to create different digital economy products and services for consumers. Improving the consumption patterns and trends of urban and rural residents, promoting the limits of Chinese market mobility, reducing to some extent the uncertainty of Chinese residents' future consumption, stimulating and increasing the consumption level of Chinese residents, determining the importance of household consumption in the economy, China's continued demand for the role of consumption as an economic engine, creating a two-loop interactive model of domestic and international development, and providing a long-term development of the Chinese economy and China's stable growth by providing a more sustainable foundation. In addition, based on the findings, this paper makes specific policy recommendations, such as improving digital infrastructure, improving financial products and derivatives related to digital economy services, and improving the quality of financial services currently available to citizens. Increasing the disposable income of urban residents is relevant to boosting consumption, increasing domestic demand, and promoting domestic capital flows in China.

2. Literature review

2.1. Review of digital economy

National: In 2005, the United Nations first supported integrated finance within the framework of financial services. This is a financial system that can serve all sectors of society (Bacchetta & Gerlach, 1997). The rapid development of new technologies such as cloud computing, face kernel, and artificial intelligence has also made significant contributions to the development of China's digital economy. Compared to the traditional economy, the digital economy can meet the livelihood needs of low-income and economically disadvantaged people. It cannot affect the modern traditional economy, but it also reflects the inherent importance of the digital economy (Li et al., 2016). Digital economy companies now support Chinese consumers, credit, insurance, finance, and other financial products. Currently, most domestic and foreign articles and journals on the digital economy and household consumption focus on the macro level and less on the micro level, focusing mainly on the relationship between the micro level and socioeconomic development and regional disparities (Cole et al., 2022).

Foreign researchers have discussed the social impact of the digital economy at both the micro and macro levels. Inclusive corporate tax policies aim to eliminate the economic exclusion of poor rural households, rural residents, and other relatively disadvantaged groups. The goal of the digital economy is to provide financial services products and related financial services to those with normal needs. According to Professor Du Xiaoshan, the goal of the digital economy is to open the market for goods and services to all poor and local rural populations (Alesina & Perotti, 1994). Therefore, the digital economy system must be constructed at the macro, meso and

micro levels, and the digital economy system, which China excluded from the original financial system, must also be integrated into the national fiscal policy and financial service system. Professor Jiao Jinpu argues that the establishment of a digital economy system is a major innovation in China's financial foundation theory and undermines the 'rich' attribute of Chinese finance. We reiterate: the disadvantaged must have the same public services as the rich. On the other hand, Professors Yang Haiyun and Zhou Xiaochuan argue that integrated funds are created and generated by a variety of financial institutions that can provide a broader range of services to all sectors of society, different companies and individuals in an equitable manner. Meeting the appropriate financial needs of all sectors of society ensures the healthy, harmonious and sustainable development of the social financial system. Bai Qingxian points out that the digital economy is central to the return to traditional finance (Allen et al., 2022). The core of modern finance is to break the constraints of traditional finance by optimizing resource allocation and restoring profitability. The economic aspects of business services meet this requirement.

2.2. Literature review of income consumption theory

Foreign researchers' studies on the causes of consumer values are mainly based on Western consumption theory, which supports the income-defining theory. Professor Anne and others have found that the long-term impact of income on consumer choice is greater than the short-term impact of income on consumer behavior, but the impact of income on consumer spending lags far behind (Deaton, 2022).Terry explains that, based on data from the 1999–2010 Rural Consumption Panel, the income gap between urban and rural residents in China is closely related to the level of consumption of urban and rural residents, but the impact varies by regional economic and social development.

As research on the value of consumption of urban and rural Chinese residents has intensified, researchers are no longer limited to government income and its impact on urban and rural consumption (Soman & Cheema, 2002). Professor Li Shupei used time-invariant simulations and experiments to study the impact of public spending on urban and rural consumption over the 30 years of reform and opening up. The impact of public expenditure on consumption levels of urban and rural residents varies from city to city, resulting in different consumption levels of urban and rural residents. Based on population data of county-level cities, Jiang Nanping and Wang Xiangnan systematically studied the role of urban and rural consumption levels in promoting urbanization and showed that urbanization played an important role in promoting population consumption growth (Levchenko, 2022).Professor Ming Prince delved into the regional impact of the difference between urban and rural consumption levels from the perspective of regional impact and found that the per capita income of urban and rural residents gap has an impact on the growth of the consumption gap in China. This suggests that China's economic development has some regional impact on narrowing the consumption gap. Zhao Wei and Wang Liqiang conducted an empirical study on the impact of the income gap between urban and rural residents on the consumption level of urban and rural residents in the new

period. The results showed that the income gap and consumption gap of urban residents increased significantly.

2.3. Review of the digital economy on young people's consumption in the context of the new crown epidemic

In terms of the new crown context, the digital economy has two main aspects: promoting new consumption patterns, new forms of business and young people's consumption. The digital economy helps to improve the product supply chain.

First, the digital economy creates new consumption patterns and business forms that make it easier for young people to consume. Due to its virtual nature and trade barriers, the digital economy has become the preferred choice for explosive growth. Restrictions on physical contact have led to changing consumption patterns and the rapid growth of electronic transactions (Campbell & Mankiw, 1991). Individual vendors are selling products online through micro groups, apps and other digital tools. Both online consumption and on-site sales are designed to ensure 'no work' and present multiple phenomena in epidemic prevention, control, and treatment. The use of the digital economy has further narrowed the gap between merchants and consumers, improving the consumer shopping experience and becoming a new driver in China to address the negative impact of the epidemic (Yakita, 2001).

The new coronavirus epidemic has changed traditional consumption patterns. The growth of the digital economy has certainly contributed to the rapid development of this model. The epidemic has also affected the demand for cash. The concept of household consumption is evolving in a healthy way. With the normalization of vaccinations, especially under the pressure of global vaccination, more and more people's consumption concepts are changing over time. The direct result is less partying, keeping social distance, wearing masks, etc. (Lauer, & Lyman, 2022). These services are gradually changing consumption patterns: reducing the frequency of offline spending and focusing on one-time purchases. The concept of digital finance is relatively new. consumption of low-income households in the Midwest and urban areas (Kantor & Fishback, 1996). Based on relative farm income theory, Professor Cui Haiyan argues that the development of integrated digital financial services can promote economic growth. The level of urban consumer spending has a significant 'demonstration effect' on rural residents. Information on rural areas and farmers in each province of China, including digital economic activities and related consumption levels, is used.

The hypothesis is that the impact of the new crown pneumonia epidemic on the consumption of young people in the digital economy is significant.

2.4. General review of the literature

First, domestic and international research on the digital economy is just beginning. Currently, domestic research on the digital economy focuses on identifying, classifying, and assessing the level of economic development and examining its macroeconomic impacts. 2016-2021 has seen the development of a new definition of financial services through digital integration, but little research has been done in this area.

Second, the relationship between economic development and consumer behavior has been extensively studied by the Chinese National Academy of Sciences. Most researchers believe that development can effectively contribute to consumer behavior, but others argue that economic inclusion of services is not inevitable and positively affects the consumption of our citizens (Bayoumi, 1993). Currently, the research path of digital finance development and consumption in China is reflected in two different research results, but there are no specific findings. Based on previous studies, this paper explores the mechanisms of the impact of digital economy development on micro household and provincial consumption levels in China. Looking at the existing studies and literature, the authors conclude that there is still a shortage of research in this area (Beaton, 2022). Current research in China in this area focuses more on the overall impact of the digital economy rather than on effective analysis and discussion of the details of digital technology development and use. Based on previous research, this paper combines these theories and shortcomings to propose and discuss policy recommendations on the development of China's digital economy and its impact on China's economic development and national consumption.

3. Research hypothesis and research design

3.1. Modeling the role of the digital economy on young people's consumption

Domestic and international researchers often use the diamond model to study economic behaviors such as intermittent consumption and investment. Financing can provide immediate allocation of resources, and the digital economy has two characteristics: comfort and integration, which can reduce capital expenditures, increase lending, and have an impact on consumption in all segments of society. Based on the diamond model, this paper discusses the impact of the digital economy on household consumption (Kimball, 1990).

The model assumes that the production of only one good in the economy depends on the labor and capital factors available for consumption and investment. Life expectancy is divided into young and old. Among young people, young people often invest in all loans, including wages and credit investments, when people earn, consume and invest from work and the return on investment exceeds the cost of credit (Jappelli, & Pagano, 2022). Older people do not get paid. The rest of the income comes mainly from investments in young people who must repay their loans. In short, this work creates a diamond model that considers only income, investment, consumption, and credit by adding assumptions. Based on these assumptions and interpretations, the diamond model is described as follows.

$$Y_t = C_t + I_t - f(dfi) \tag{1}$$

$$0 = (1 + i_t)I_t + (1 + i_t)f(dfi) - \left[\left(1 + \gamma/g(f(dfi))\right)\right]f(dfi) - C_{t+1} + Y - Y_t \tag{2}$$

Equations (1) and (2) above are personal income and expenditure equations for young and old. In model (1), Yt is the total income of young people, CT is the wage consumption and investment, and F(DFI) is the amount of credit after the

introduction of the digital economy. Let us assume that this function is an additional function of the DFI digital economy. The more the digital economy grows, the more credit is financed. In Equation 2, Ct + 1 is the consumption of the elderly, Y is the total income, γ is the return on investment, γ is the cost of loans and capital loans, and G(f(dfi)) is an irrevocable function of the size of the credit fund.

$$Y = \left[\left(1 + r/g(f(dfi))\right)\right]f(dfi) + C_t + C_{t+1} \tag{3}$$

Y in Equation (3) is the national income and C is the consumption in different periods. All others are digital financial parameters.

After the introduction of the digital economy, the scale of credit is proportional to the level of consumption of the population, i.e., the higher the scale of credit, the higher the level of consumption of the population. At the same time, the cost of digital business credit is inversely proportional to household consumption, i.e., the lower the cost of credit, the higher the household consumption. Overall, the economic impact of this equation is that the digital economy reduces the cost of credit and expands the scope of credit, which ultimately leads to improved household consumption.

In this paper, the simulation process of the model in the research process, mainly used SPSS software for data simulation, the specific simulation results in the table (Table 1).

3.2. Analysis of intermediate mechanisms by digital economy

Digital finance can facilitate the exchange of information and reduce the cost of asymmetric information, thus improving access to credit for financial institutions. Credit regulation models suggest that the digital economy has a 'full impact' on lending. The digital economy can significantly increase the availability of cross-border credit in rural areas compared to the traditional economy, as the supply and demand for credit benefit from the development of the digital economy. In terms of access to credit, financial institutions can, among other things, raise real-time capital from borrowers and lenders as a digital supplement and monitor borrowers' advances, indirect loans and payments, thus effectively reducing the short-term credit process. Credit quality has also improved significantly. Second, the digital economy provides financial institutions with efficient, affordable, and low-threshold financial services (Caballero, 1990). Improved access to credit and financing for micro and small enterprises, start-ups or traditional rural areas, the introduction of securities and other products to provide credit services tailored to the personal financial needs of micro and small businesses or individuals; and the use of big data, cloud services and other digital technologies to create reliable risk management systems have significantly improved financial risk management. In the case of credit needs, financing is often provided on a diverse and personalized basis, which is sufficient to ensure that financial services and resources are efficiently provided to meet their needs in a relatively short period of time. The development of a digital economy creates an efficient, convenient and

Table 1. Description of the definition of statistical variables.

Variable	English symbol	Number of data collection	average value	standard deviation	minimum value	Maximum
Youth consumption level	CON	2841	13627	4963	5.381	44.362
Digital Finance	DF	2841	2148	1.362	0.281	4.638
Coverage	Cov	2841	1692	0.917	0.066	5.621
Use Depth	Depth	2841	2054	0.941	0.311	6.328
Digitization level	DIG	2841	6357	0.362	4.628	8.621
Corporate credit leverage	LEV	2841	0.854	0.157	0.328	0.624
Urbanization level	Ub	2841	0.638	0.362	0.968	0.638
Education level (years)	Year	2841	10.352	0.817	0.631	10.327
Level of financial support	Fin	2841	0.638	0.136	8.621	0.951
Proportion of child support	Chi	2841	0.381	0.036	4.361	44.628
Local real GDP (¥)	Ngdp	2841	9.638	0.258	2.361	11.367

transparent digital economy platform for residents to effectively improve their creditworthiness.

Current theory suggests that credit availability has a significant impact on household consumption. Professor Yao and other researchers have noted the impact of household credit availability on consumption and found that the efficiency of household credit plays an important role in regulating the relationship between consumption and income. Through an analysis of credit experience, Edin finds that expanding credit stimulates the poor and their consumption. bachetta and Gerlach conclude that total credit has a significant impact on consumption in all countries. Li, et al. (2016) studied the impact of credit restrictions on consumption of rural households in South China and found that credit restrictions affected 54.9% of respondents. Overall, the expansion of credit availability stimulates the consumption gap and increases the share of consumption in income, contributing to an effective and stable growth in the quality and quantity of consumption in China (Barrell & Davis, 2007).

3.3. Variable selection and data processing collection

The definition of statistical variables is shown in Table 1. Explanatory variable:Household consumption (CON). This is measured by consumption per capita. These data are taken from China's statistics from 2011–2019, and the 2011 Consumer Price Index is used to determine real per capita consumption expenditure (in thousands of dollars), excluding the effect of price fluctuations.

Significant explanatory variables: The Digital Finance Index (DFI) and its width, depth and volume.The DFI is a tool to measure the current level and trend of development of the digital economy.

Control variables: In this paper, a set of control variables is chosen to study the impact of the digital economy on household consumption. Urbanization index is the ratio of urban population to total population at the end of the year in each province. Average years of schooling (ESU) is the average number of years of schooling of the 6-year-old population in each province. Fiscal expenditure (BIS) is the ratio of total budgetary expenditure to GDP (Gross Domestic Product) in the region. BIS is a consumer price index expressed as the proportion of children in the province's working age population, which mainly controls for the effects of consumer price fluctuations and is relatively stable, meaning that people's daily consumption habits and expenditure

Table 2. Heterogeneity of rural-urban and income differentials combined analysis.

Index and Criteria	Household type-city	Household type-countryside	Income type-low	Income type-middle	Income type-high
Constraints	−0.071***	−0.009*	−0.061***	−0.004***	−0.081*
	(0.041)	(0.081)	(0.038)	(0.081)	(0.047)
Digital Economy Index	0.063***	0.007***	0.001***	0.064**	0.039
	(0.026)	(0.063)	(0.081)	(0.016)	(0.026)
Control Type – Variable	Yes	Yes	Yes	Yes	Yes
Data volume - Family type	6581	6581	6581	6581	6581
Data Volume - Region Type	36	36	36	36	36

patterns are better adapted to the current macroeconomic environment. Regional economic growth mainly affects GDP per capita, which is a logarithm. The industrial structure is mainly reflected in the ratio of surplus value of upper and middle industries to surplus value of secondary industries in each province (Aron et al., 2012).

Data sources: (1) The raw data of the comprehensive digital economy index and its three subsystems are from the digital economy index published by the Digital Economy Research Center of Peking University; the raw data of other variables are from the China Statistical Yearbook, provincial statistical yearbooks and the WAND database. The raw data of the comprehensive digital economy index and the comprehensive digital economy index are from the digital economy index released by the Digital Economy Research Center of Peking University. The data processing procedures were as follows: (1) Based on data availability and overall efficiency, the test sample consisted of 30 non-Tibet provinces, cities and autonomous regions. (2)Based on the release date of each variable, the time interval of the sample was defined as 2011 to 2019. (3) To reduce heterogeneity, we used the logarithm method for the control variables, whereby GDP per capita declined. The statistics describing these variables are given in Table 2.

The 294 samples that appear in the study represent the 294 samples collected from each region for statistical analysis.

4. Results and discussion

4.1. Results of the impact of the digital economy on young people's consumption

The main variables explaining this piece are the overall digital economy indicators and their coverage, utilization and degree of digital economy. The results show that the overall digital economy indicators and sub-indicators pass the test with a 1% growth. Under the same conditions, the aggregate digital economy index would increase consumption per capita by $1,129,000. This indicates that the development of the digital economy has effectively raised the overall consumption level of Chinese citizens. The main reasons are as follows. (1) the digital economy contributes to the effective expansion of the financial services sector, reduces the gap between urban and rural consumption, and is an important factor in building a new development model. The digital economy has common features of participatory financing that can alleviate liquidity bottlenecks, facilitate payments and housing for residents, and greatly liberate their consumption. The digital economy uses service scenarios and

benefits to lower the threshold and cost of financial services, promote rational allocation of funds, and effectively improve access to capital. Among the control variables of the total digital economy index, the retention rate of children is positive, i.e., 5% indicates that the younger the population, the greater the impact on consumption levels. The GDP per capita is significantly positive (5%), indicating that economic growth promotes consumption and releases consumption power. Consumer price index and industrial structure have a positive impact on consumption. The significant negative urbanization coefficient of 1% indicates that the urbanization process is essentially semi-urban due to the housing system, which has a deterrent effect on increasing the consumption level of the population.

4.2. Endogeneity of the digital economy affecting consumption

This paper focuses on the impact of the digital economy on household consumption, but the above regression model can only partially explain the causes and consequences of the endogeneity problem. Since the digital economy and household consumption can influence consumer attitudes, cultural habits, and other factors, these immeasurable factors can affect the regression results. To reduce estimation errors due to missing dependent variables, indicator variable 1 (IV1) should be the result of the number of post office and Internet users and the difference between first order and first order (DFII, T-1). xDFII, (t) reevaluates the model as instrumental variable II (IV2). The results show that the DFI regressors are significantly positive. cragg Donald and Kleibergen Paapwaldkf are13.84% and 158.45.9493, 45991 yoga reserve tests with thresholds of 15% and 10%, respectively, or 8.96%. 16.38 Kleibergen Paapklm's statistics pass the 1% validity test, which indicates that the weak variables of the instrument overturned the original hypothesis, and the inseparability test indicated that the instrumental variables selected were consistent with exophysicality. The above results are consistent with the baseline regression results, indicating that the digital economy can indeed contribute to household consumption.

4.3. Robust analysis of the digital economy's impact on consumption

To verify the reliability and robustness of the model, we also attempt to check the reliability of the estimates by changing the econometric model, changing the underlying explanatory variables, and removing the sample.

In this paper, a dynamic panel model is used for regression analysis and modeling, and two-stage data are used to analyze the delay in the demographic consumption variable. This shows that the digital economy can significantly improve household consumption. Due to marginal effects, each unit of the digital economy index increases household consumption by $13,700, which is consistent with the above regression results. To improve the reliability of the frequency results, the methodology for measuring the digital financial composite index will be improved. The new digital composite index (Digital Composite Index, Digital Composite Index and Digital Composite Index) consists of three dimensions: the degree of coverage of the digital economy, the digital depth and the use of digital qualifications and their use

Table 3. Statistics of consumers' education level.

Index and Criteria	Duration of education 0 years (1)	6 years of education (2)	9 years of education (3)	Educated for 9 years (4)	Educated for more than 9 years (5)
Constraints	−0.039***	−0.067*	−0.032**	−0.007***	−0.031*
	(0.064)	(0.039)	(0.039)	(0.038)	(0.041)
Digital Economy Index	0.008	0.004	0.003***	0.092***	0.067*
	(0.063)	(0.046)	(0.021)	(0.001)	(0.069)
Control type-Variable	Yes	Yes	Yes	Yes	Yes
Data volume - Family type	2814	2814	2814	2814	2814
Data Volume - Region Type	38	38	38	38	38

Table 4. Heterogeneous statistics of the regional dimension.

Variable	Southeast coastal region (1)	Central region (2)	Western region (3)	Northeast region (4)	High economic growth (5)	Medium to high economic growth (6)	Low economic growth (7)
Digital Economy Index	1.873***	0.351**	0.316	0.632	1.934**	0.817***	0.261
	(2.12)	(1.11)	(1.93)	(1.74)	(1.63)	(6.81)	(0.62)
Constant term	10.382	−10.284	17.362***	11.362*	10.827	5.217*	17.638**
	(1.71)	(-3.63)	(6.81)	(2.81)	(0.924)	(1.36)	(3.41)
Control type-Variable	YES	YES	YES	YES	YES	YES	YES
Control type-geography	YES	YES	YES	YES	YES	YES	YES
Control type-time	YES	YES	YES	YES	YES	YES	YES
Sample value	294	294	294	294	294	294	294
Square of the statistic R	1.041	1.158	1.021	1.004	1.007	1.031	0.957

as essential elements of the model. The study shows that, in other cases, the Digital Economy Composite Index continues to grow by $53,700,000 and residential consumption by $537 million. The results are presented in the third column of Table 3, concluding that there is a positive correlation between the digital economy and household consumption.

4.4. Heterogeneity analysis of the digital economy Affecting consumption

4.4.1. Heterogeneity of digital economy-influenced consumption-region

China is a large country with unstable regional resource supply. In this paper, the sample is divided into eastern, central, western, and northeastern regions, and the regressions are grouped to determine whether geographic differences affect the impact of the digital economy on household consumption. The results are presented in column 1 to column 4 of Table 4. The results show that approximately 1,763 Eastern and Central residents consume at the following levels: when the digital economy grows by one unit, the income of 2,200 people increases when the digital economy has a smaller impact on household consumption. This is mainly due to geographical differences in economic resources. The consumption potential of the Eastern and Central regions shows that the components of 'Central Region Growth', the gradual improvement of financial instruments and the continuous improvement of financial information and services show a high consumption potential. It is the foundation of the digital economy and will help unlock the potential of consumers in terms of reduced tax restrictions and increased access to credit. In the West and Northeast, the lack of integration of economic resources, transportation and population mobility

voting quotas has led to a lack of incentives for a significant increase in household consumption.

Xiaojing and Liu (2020) analyzed the probability distribution of risks and substitutions using a risky growth model. In this context, GDP per capita growth in 2020 is also considered as the main indicator of economic growth, divided into three levels: high, medium, low, high and low. Each level contains 10 provinces that must be evaluated for the regression sample. Columns 5 to 7 of Table 4 show the results, indicating that the regression coefficients in columns 5 and 6 are positive if the priority level is 1%, but the results in column 7 show that low economic growth in each region has almost no effect on the consumption of the population. The better the financial environment and the greater the economic growth, the greater the role of the digital economy as a catalyst for the growth of residents' consumption and their ability to consume.

4.4.2. Heterogeneity of the digital economy Affecting consumption-consumption

In order to provide complete information on the conditional distribution, sections 0.1, 0.25, 0.5, 0.75 and 0.9 are used to further explain the impact of general measures and subsystems in the digital economy on different levels of consumption of the population. In particular, the results in the first column of Table 4 show that the impact of the digital economy index on household consumption is positive at all stages, as confirmed by the previous regression results. The results in columns (2) and (5) show that the digital economy coefficients are 0.25, 0.5, 0.75 and 0.9 deciles, which are higher than the regression coefficients of 0.1 decile and 3073, respectively, and that consumption is most affected by 0.75%. This implies that the digital economy is more important than the low-consumption sector, encouraging the high-consumption sector, unleashing the consumption potential more effectively, improving the overall consumption dynamics and encouraging consumption growth. This may be related to household income. High income is one of the main reasons for high household consumption, which implies that consumers have sufficient financial liquidity, decentralized resource allocation, great potential for capital consumption, comfort, low costs and low barriers to entry. The digital economy can easily become an important financial tool to unlock the consumption potential of low-income people.

In addition, Table 5 shows the impact of three sub-indicators on household consumption levels in different quantities: digital economy coverage (width), depth (depth) and quantity (quantity). The results show that the regressions for size and depth are consistent with the general indicators of the digital economy, and that the regression coefficients for the different decimal points increase progressively with the level of consumption of the population. This result is usually attributed to the favorable economic environment, favorable consumption environment and demographics in the large consumption area, while the impact of digital technologies on population consumption is small and varies significantly. The development of digital infrastructure remains insufficient and unsustainable. The impact of the digital divide is due to the lack of tools for the development of digital infrastructure.

Table 5. Statistics from different quantile perspectives.

Variable	10Q	30Q	55Q	70Q	85Q
Digital Economy Index	2.981**	9.621***	6.821***	8.932***	8.174***
	(1.82)	(5.08)	(6.81)	(5.92)	(5.81)
Breadth of digital economy coverage	4.05**	3.617**	3.117**	7.618***	8.691***
	(2.81)	(2.87)	(2.81)	(3.51)	(5.04)
Depth of digital economy usage	1.661***	3.917***	4.058***	4.819***	4.012***
	(3.81)	(5.36)	(5.91)	(5.32)	(3.61)
Degree of digitization	0.271	−0.081	−0.651	−0.647	1.628
	(0.41)	(-0.07)	(-0.63)	(0.61)	(0.62)
Control type - variable	Yes	Yes	Yes	Yes	Yes
Control type - time	Yes	Yes	Yes	Yes	Yes
Control Type - Geographical	Yes	Yes	Yes	Yes	Yes

4.5. Mediation analysis of the digital economy affecting consumption

This section discusses the indirect effects of loan supply in the model. The first section examines the overall impact of the digital economy on citizens' consumption and attempts to explain that the digital economy can increase credit availability and consumption by reducing the fiscal constraints of residents. The paper also discusses the indirect impact of the digital economy index on the access to consumer credit for urban and rural residents.

4.5.1. Mediation test for credit

According to the marginal impact of the digital economy in CON1, the digital economy index will increase consumption by $1,129 per unit.Leo and Con2 investigate whether the independent impact of credit availability is significant and whether their shares are proportional. The results show that a unit of credit increases domestic consumption by $1,344,000. The development of the digital economy effectively contributes to the credit supply: the direct impact is 1.047, the indirect impact is 0.082, and the indirect impact is 7.26%. It should be noted that the goal of the digital economy should be not only to increase income, but also to reduce the financial burden on people, which is one of the main policy guidelines to fully utilize the consumption potential. Promote market dynamics more effectively and create sustainable intrinsic energy for the development of new development models.

4.5.2. Different levels of effects of the digital economy

Access to credit is an important mechanism by which the digital economy affects household consumption. Does the subsector of the digital economy based on credit mechanisms contribute to increase household consumption? To investigate this question, the scope, depth and degree of digitalization of the digital economy will be introduced in an intermediate product model with stepwise regressions and directional tests. The results show that the digital economy has reached the 1% level of significance. The results show that the direct impact factor for each subindex is 11129, the indirect impact of loans on hedging is 0.089 and the depth of use is 0.089.0059, representing 7.30% and 12.61% of the total risk, respectively. The confidence level does not include 0 self-help method tests. The economic implications of these results are that the expansion of the digital economy and the decline in business

depth could effectively increase credit to better serve household consumption. On the other hand, credit availability plays a secondary role in the consumption process. The confidence interval is restricted to zero, which implies that credit determination fails in the load test and is consistent with the regression results of the previous components. This could be due to the fact that the digital economy provides credit services mainly to micro and small enterprises, self-employed, rural households, low-income urban groups, etc. While this is an important way to remove barriers to consumer growth, it will inevitably create a digital divide.

4.5.3. Digital economy effects of different types of consumption

In particular, from the perspective of livelihood consumption, the digital economy can effectively stimulate consumption through the provision of credit services and increased lending, thus contributing to the survival of urban and rural residents. Indirect effects account for 6.95% and 4.19% of the total effects, indicating that the digital economy contributes to credit growth. Urban and rural residents increase their consumption of basic needs when raising funds. From a consumer perspective, the indirect impact of urban and rural residents has not been tested, suggesting that leisure, tourism and other consumption should not contribute to credit through the digital economy, but the facts are consistent, as consumption usually benefits from high consumption. These goods are transported by high-income people who do not need credit to meet consumer demand. From a consumer development perspective, urban credit has a clear mediating role. The confidence interval is not 0, which corresponds to 4.50% of the total impact, while the opposite is true for the indirect impact of rural credit. These differences suggest that the digital economy in urban areas can increase development consumption by increasing credit services such as education and health, while rural financial networks are not yet fully established and financing supply chains are not yet well developed. Lack of effective credit for education and health is the main cause of education and illness among the elderly in rural and rural areas. It is worth noting that through increased lending, the digital economy has mainly contributed to the development of consumption in rural and urban China and provided the framework for related policies in China.

5. Heterogeneous statistical tests for different samples

5.1. Heterogeneity test of the binary structure

Due to the long-term characteristics of China's urban-rural economy, the digital rural economy tends to develop at a lower level than the urban one. To test the heterogeneity of credit lines, the sample is divided into urban and rural households. Rural residents' subsistence economic model and relatively conservative consumption attitudes make them uncertain about credit constraints. Compared to urban households, rural households tend to be economically repressed due to limited capital and funds. Thus, the rapid growth of the digital economy of rural households alleviates the external credit constraints of the urban economy and reduces the role of the rural economy.

5.2. Heterogeneous statistical tests for disposable income classification

Credit restrictions may limit the consumption of different income groups. Based on annual household income, the sample is divided into low-income, middle-income, and high-income groups. The regression results are presented in columns 3 to 5 of Table 2. The regression results indicate that credit crisis recovery is significantly negative for different income groups and that the impact of credit crisis on household consumption varies by income group. On the other hand, credit restrictions continue to discourage consumption among low-income groups, and easing credit restrictions may help low-income groups to consume. Meanwhile, the interaction between different dimensions of the digital economy has a significant positive impact on low-income households, but does not pass the appropriate test for high-income households. This may be because low- and middle-income households are more likely to suffer from severe credit shortages because their incomes remain low, hindering consumption growth, better supporting the digital economy, reducing credit constraints, and increasing consumer spending. However, credit constraints do not affect high-income households, which have little to no impact on consumer spending. The impact of the digital economy on reducing credit constraints is limited.

5.3. Heterogeneous statistical tests for different levels of education

Differences in human capital not only affect residents' credit limits, but also require a certain level of online knowledge and skills to develop digital services. Therefore, the sample is divided into five groups (illiterate or semi-literate), comprehensive school, high school, high school (or industrial, industrial and vocational) or higher (including secondary education) according to the educational level of the household head. Regression results show that credit limits limit the consumption level of household heads regardless of their education level, but gradually decrease as the education level increases. In addition, the impact of multilevel digital economy interactions has become apparent and increases only when the owner reaches an above-average level of education. One possible explanation is that by improving household education and human capital accumulation, financial markets alleviate credit constraints and reduce the constraints they face. At the same time, the ability to use the digital economy to alleviate credit constraints and meet consumer demand will increase as economic knowledge increases and Internet capacity increases.

6. Conclusion

The quality and quantity improvement of household consumption is the fundamental basis for expanding domestic demand and opening a broad internal circulation and a sustained favorable economic cycle. The digital economy based on advanced digital technologies is characterized by convenience, low cost, and low threshold, which can effectively improve the efficiency of financial services and thus stimulate household consumption. Based on data from 2011- 2019, this paper analyzes the impact of the digital economy on household consumption and discusses the impact of indirect credit mechanisms on household consumption using a two-stage stationary model,

two-stage least square, quantitative impact, and indirect impact. The results show that (1) the digital economy significantly increases the level of residential consumption and the test results remain stable. The development of the digital economy related to residential consumption shows significant regional ecological heterogeneity and diversity of consumption characteristics. In particular, the impact is greater in the eastern and central regions than in the western and northeastern regions. The financial environment is more favorable, the regional economic growth is faster and the consumption capacity of the population is higher, while noting that the digital economy has a greater impact on the high consumption sectors, depending on the consumption level of the population, which may unlock the potential of high consumption groups. The analysis of the indirect impact model leads us to conclude that credit affordability is an important means of transferring the scope and depth of the combined and disaggregated indices of the digital economy to household consumption. However, the digitization of the disaggregated indices did not increase household consumption through increased credit, suggesting that a digital divide still exists. Further analysis shows that the digital economy can also alleviate economic constraints and positively impact urban and rural consumption and urban development consumption. On this basis, the panel makes the following strategic recommendations.

Further analysis shows that the digital economy can also alleviate economic constraints and positively affect urban and rural consumption and urban development consumption. Based on the positive impact on young people's consumption, the panel proposes the following innovative strategic recommendations.

First, actively develop the digital economy. Facilitate the entire digital mobile development process by developing online platforms or mobile applications that support consumers' independent access to financial services online and create integrated online service models, both online and offline. In addition, the digital economy needs to reach remote rural areas to provide farmers with appropriate financial products, reduce the cost of purchasing farmers' financial services, and improve the efficiency of financial services to implement national development strategies.

Second, improve the consumer financial system. Encourage effective integration of consumer credit data, optimize pricing, and risk management models, and improve customer identification and lending. Reduce the reliance on collateral security and gradually increase the share of credit; ensure that more funds flow to large consumers.

Third, a favorable consumer environment must be created. On the supply side, we should create demand from residents, continue to provide diversified products for citizens, and enrich product offerings to further promote consumption growth. In terms of demand orientation, we should strengthen rural consumption trends, optimize the product structure from the perspective of the entire consumer market, gradually expand the market, and improve the consumption satisfaction of urban and rural residents.

Disclosure statement

No potential conflict of interest was reported by the authors.

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