Consumption and Distribution Effects of China's Digital Inclusive Finance: An Empirical Study Based on CHFS Data

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Abstract

The continuous promotion of digital inclusive finance has not only produced many macroeconomic effects, but also profoundly affected the decision-making behavior of micro family subjects. This paper uses the data of China Household Finance Survey (CHFS) and the regression method of the Decentralized Influence Function (RIF) in 2015, 2017 and 2019 to empirically assess the impact of digital inclusive finance on household consumption behavior. The research finds that: (1) digital inclusive finance has significantly improved household consumption level. The benchmark conclusion is still robust after considering endogenous issues. On the one hand, digital inclusive finance can improve household consumption by increasing the per capita consumption of low consumption households and increasing household spending on food, household equipment, transportation and other aspects; On the other hand, digital inclusive finance can also improve household consumption by improving financial literacy, easing liquidity constraints and improving payment convenience, and these three mechanisms explain about 68.9% of the benchmark effect. In addition, the main beneficiaries of the positive consumption effect of digital inclusive finance are: households with high school education and above, and households in rural and central and western regions. Further analysis shows that the development of digital inclusive finance is a double-edged sword, because it increases the probability of excessive consumption of young people. (2) The research finds that the development of digital inclusive finance helps to reduce the Gini coefficient of residents' consumption. Specifically, every 10% increase in the development level of digital inclusive finance will reduce the consumption gap by 0.64%. Mechanism analysis shows that the development of digital inclusive finance mainly alleviates the inequality of consumption of Chinese residents by improving the financial literacy and payment convenience of vulnerable groups. In addition, the depth of the use of digital inclusive finance, especially the deepening of credit, payment and monetary fund businesses, helps to narrow the consumer gap, and the reduction of the benchmark difference is mainly reflected in food, durable goods and education expenditure. The heterogeneity analysis shows that the role of digital inclusive finance development in reducing the consumption gap of residents is more significant in cities, high uncertainty, high dependency burden and families with retired people, which is consistent with the original intention of digital inclusive finance development to improve the scope of financial services and reduce the cost of financial services for vulnerable groups. Further research also found that the endowment effect is the cause of consumption differences among different digital inclusive financial development groups, among which household registration, household population size, per capita household income and regional economic development level differences are the main factors leading to this result. The above conclusions have important practical implications for a comprehensive understanding of the microeconomic effects of the deepening of inclusive finance.

Keywords: digital inclusive finance, household consumption, excessive consumption, consumption Gini coefficient

1. Introduction

As China's economy has entered the new normal and the old and new development drivers have entered the transition period, the role of the consumer market in promoting high-quality economic development has become increasingly prominent. As one of the three carriages driving economic growth, consumption not only determines the employment rate, industrial structure and income gap at the macro level (Zhu Xinkai, Luo Chen, 2011; Meyer&Sullivan, 2013), but also affects the comprehensive welfare level of micro family subjects (Dogra&Gorbachev, 2016). The Central Committee of the Communist Party of China clearly proposed in the "Fourteenth Five Year Plan" and the long-term goals and recommendations for the year 2035 to form a strong domestic market, comprehensively promote consumption and enhance the basic role of consumption in economic development. However, how to specifically cultivate the consumer market and further stimulate domestic demand from the micro household level requires a deeper understanding of the determinants of consumption. By the end of 2020, China's GDP has exceeded 100 trillion yuan, and the final consumption rate of residents has reached 39.2%, but the fact that consumption continues to be sluggish still exists. As shown in Figure 1.1, the final consumption rate of Chinese residents ranks tenth among the top ten economies in the world, 13.2 percentage points lower than that of Germany, which ranks ninth. In terms of horizontal comparison, the consumer market still has huge development potential, so how to boost domestic demand is still the core topic of the two sessions of the political education.

The concept of inclusive finance is a new concept proposed by the United Nations when it publicized the "Year of Microcredit" in 2005. Its purpose is to solve the problem of financial exclusion worldwide. In 2013, the Third Plenary Session of the 18th Central Committee of the Communist Party of China adopted the Decision of the Central Committee of the Communist Party of China on Several Major Issues Concerning Comprehensively Deepening Reform, formally proposing the development of inclusive finance. In September 2016, the G20 Hangzhou Summit released the G20 High Principles for Digital Inclusive Finance, which is the first time that digital inclusive finance has stepped onto the international stage. "Promoting inclusive finance development by using digital technology" is the first principle, which marks that digital inclusive finance has officially become an important direction of global financial poverty alleviation in the future. China's digital inclusive finance based on big data, information technology, cloud computing and other technologies has made great progress, as shown in Figure 1.2. The development of digital inclusive finance can provide efficient and fast payment methods and convenient and diversified financial services for the majority of residents, reduce the threshold for people to access financial products, and have an important impact on all aspects of social economy (Guo Feng et al., 2020).

Investment, consumption and export are the troika driving economic growth. The Fifth Plenary Session of the 19th Central Committee of the Communist Party of China clearly pointed out in the Proposal of the Central Committee of the Communist Party of China on Formulating the Fourteenth Five Year Plan for National Economic and Social Development and the Vision for the Year 2035 that it is necessary to accelerate the construction of a new development pattern with the domestic big cycle as the main body and the domestic and international double cycles promoting each other. This shows that the urgent task for the development of the market economy is to give play to the potential of domestic demand in the domestic market and release the potential of

residents' consumption. At the same time, in 2016, China put forward an international common program for the development of digital inclusive finance - G20 High Principles for Digital Inclusive Finance, thus establishing the strategic position of digital inclusive finance development. Digital inclusive finance, with its advantages of strong penetration and convenience, has effectively broken the restriction of consumption space distance, reduced the problem of information asymmetry between supply and demand, enriched consumption types and payment methods, which helps to improve the overall consumption level of China.

Since the reform and opening up, China's economy has made remarkable achievements, and the consumption level has also increased to a new height. As shown in Figure 1, the proportion of urban and rural population in China has increased from 0.218 in 1978 to 1.833 in 2021, and the proportion of rural population has decreased year by year. In this context, the existing literature mainly examines the urban-rural consumption gap, ignoring the research on the national level consumption inequality. The literature analyzing the impact of digital inclusive finance on the consumption gap of Chinese residents mainly focuses on urban and rural areas (Zhang Tongjin and Cai Kuanning, 2021; Wei Junying, et al., 2022) and regional differences (Zhang Haiyang and Han Xiao, 2022), and lacks research on the impact of digital inclusive finance on consumption inequality from the overall perspective. In view of this, based on the data of China Household Finance Survey in 2015, 2017 and 2019 and the Digital Inclusive Finance Development Index, this paper uses the RIF regression method to examine the impact of digital inclusive finance development on the overall residents' consumption gap and its mechanism from a micro perspective.

Digital inclusive finance, with its excellent service sinking ability and low cost characteristics, not only provides an effective way for inclusive development of financial inclusion, but also brings great vitality to boost the consumer market. Both the number of people served and the amount of consumption have grown significantly. This new financial development model has attracted extensive attention from the academic community, and many scholars have begun to pay attention to the impact of digital inclusive finance on the consumer market. Among them, research on consumption determination theory and economic effects of digital inclusive finance has been relatively rich (such as Modigliani&Cao, 2004; Fan Gang, Wang Xiaolu, 2004; Zhang Xun, etc., 2019). However, the literature on the relationship between them is insufficient. Yi Xingjian and Zhou Li (2018) studied the impact of digital inclusive finance on consumption based on the city level digital inclusive finance index of Peking University and the China Family Tracking Survey (CFPS), and Li et al (2020) matched it with the survey data of China's family finance. The results of both studies show that the development of digital inclusive finance has a significant positive impact on consumption, and mainly to ease household liquidity constraints, improve payment convenience Increasing the frequency of online shopping and optimizing the consumption structure have improved the consumption level of residents. However, these studies are insufficient: (1) The latest year and the most detailed administrative level data are not used. (2) The exogenous degree of tool variables in the identification process is insufficient. (3) Neglected the important mechanism of improving inclusive financial environment to promote residents' financial literacy. (4) The impact of digital inclusive financial development on excessive consumption is not tested. In view of this, this paper attempts to make contributions on the basis of the above research.

This paper empirically tested the causal relationship between the county-level digital

inclusive financial development index and household consumption using the 2014, 2016 and 2018 Peking University digital inclusive financial index and the 2015, 2017 and 2019 CHFS data. The research finds that: (1) The development of digital inclusive finance is conducive to improving household consumption, and the benchmark results remain stable after considering endogenous issues and other robustness tests. (2) The development of digital inclusive finance can improve the per capita consumption of low consumption households, especially the expenditure on food, household equipment, transportation and other aspects. (3) The development of digital inclusive finance mainly improves household consumption level by improving residents' financial literacy, facilitating payment and easing liquidity constraints. The intermediary effect of the three is about 68.9%. (4) Digital inclusive finance has more significant impact on household consumption in rural areas and the central and western regions where the heads of households are young and middle-aged, the heads of households have high school education or above, and the household registration is in rural areas. (5) The development of digital inclusive finance has stimulated the excessive consumption behavior of young people.

Some contributions of this paper are as follows: (1) Using more rigorous and detailed data. From the micro household level, the latest CHFS data in 2019 and the county level digital inclusive financial index in 2018 were used to study this topic, which has stronger pertinence and timeliness of policy recommendations. (2) The endogenous discussion is more scientific and reasonable. This paper uses two distance variables - logarithm of the spherical distance between the county where the family is located and the provincial capital city, and logarithm of the spherical distance between the city where the family is located and the provincial capital city as IV for causal identification. The estimation results of the instrumental variables are more convincing. (3) More scientific measurement methods shall be used for demonstration. Quantile regression is used to investigate the marginal effect of digital inclusive finance on households with different consumption levels. (4) The mechanism of action is analyzed in detail. The existing literature ignores the role of financial environment improvement in cultivating the financial literacy of microeconomic subjects. This study finds that the development of digital inclusive finance can improve the consumption level of residents by improving their financial literacy, and the corresponding intermediary effect of this mechanism is as high as 56.9%. (5) Comprehensive research perspective for systematic research. The existing literature mainly emphasizes the promotion effect of digital inclusive finance on consumption level and consumption growth. This paper further evaluates its impact on excessive consumption.

Other marginal contribution of this paper is mainly reflected in the following aspects: First, research methods are innovative. This paper uses RIF regression method to analyze the impact of digital inclusive finance on consumption inequality, thus reducing the loss of micro samples. At the same time, on the basis of existing literature, IV and bootstrap methods are combined to overcome the endogenous problem under RIF regression method; Secondly, the research object is innovative. The current literature mainly focuses on the impact of digital inclusive finance on the urban-rural consumption gap, while this paper focuses on the impact of the development of digital inclusive finance on the overall consumption inequality; Thirdly, based on RIF-OB decomposition method, this paper further explores the main factors that lead to the inequality of consumption among groups of the development level of digital inclusive finance. This not only enriched the relevant research on the socio-economic effects of digital inclusive finance development, but also deepened the understanding of the determinants of consumption inequality.

The rest of this paper is arranged as follows: The second section is literature review and brief comment. The third section is the model setting and data description. Section IV reports the benchmark regression results. The fifth section explains from the perspective of mechanism analysis. The sixth section explains it from the perspective of heterogeneity analysis. Section VII is robustness analysis. The eighth section is the expansion analysis. Section IX is the impact of digital finance on consumption inequality. Finally, summarize and make policy recommendations.

2. Literature review and theoretical hypothesis

2.1 Literature review of the impact of digital inclusive finance on consumption

So far, many literatures have carried out a lot of empirical and theoretical analysis on how digital inclusive finance affects social economy, which can be roughly divided into the impact analysis on macro-economy, financial market, enterprise innovation, family and other aspects: 1. In terms of macroeconomic effects. The development of digital inclusive finance has promoted regional innovation and entrepreneurship, promoted industrial structure transformation (Liang, 2020), promoted real economy growth (Qian Haizhang et al., 2020; Liu et al., 2021), narrowed income gap, promoted inclusive growth (Zhang Xun et al., 2019), enhanced poverty reduction effect (Wang&He, 2020), gave consideration to efficiency and equity, and achieved dual improvement (Liu et al., 2020; Jiang et al., 2021). 2. In terms of financial market impact. Digital inclusive finance can optimize the structure of traditional financial sectors, improve the quality and diversity of banking services, improve the efficiency of financial services (Berger, 2003), and effectively reduce the risk of the capital market (Wu Fei et al., 2020). 3. In terms of enterprise innovation. The development of digital inclusive finance can significantly ease the financing constraints of enterprises (Wan Jiayu et al., 2020), encourage enterprises to innovate, drive residents to start businesses, and achieve equal entrepreneurial opportunities (Zhang Xun et al., 2019). 4. In terms of family activities. Digital inclusive finance can promote the growth of residents' income (Liu et al, 2020), realize the accumulation of family wealth by means of digital penetration (Zhou Tianyun, Chen Mingxiang, 2021), and promote more families to improve the probability and ratio of participation and allocation of risky assets (Zhao et al, 2021).

In contrast, the number of literature on the impact of digital inclusive finance development on consumption is relatively limited. Yi Xingjian and Zhou Li (2018) and Li et al (2020) successively used the Chinese Family Tracking Survey Data (CFPS) from 2012 to 2016, the Chinese Family Tracking Survey Data (CHFS) from 2013 to 2017, and the data of the local level digital inclusive financial index of Peking University to empirically test the impact of digital inclusive finance on household consumption. The study found that there was a significant positive causal relationship between the two. Similarly, some papers have also demonstrated the relationship between the two by using other data, believing that digital inclusive finance can significantly promote household consumption (Song et al., 2020; Zhang Xun et al., 2020). However, the above research may have the following shortcomings: (1) The development level of digital inclusive finance in different counties of the same prefecture level city has strong heterogeneity; (2) Both use the product of the digital inclusive financial index with a lag of one period and its first-order difference in time and the number of mobile phones per capita at the provincial level as tool variables to alleviate the endogenous problem, but these two IVs are likely to be related to the explained variable, which cannot meet the exogenous conditions required for tool variables; (3) The mechanism test does not

consider the marginal response of people with different consumption levels to changes in the financial environment, and the effect of changes in the digital financial environment on people's financial literacy; (4) The consumption inequality between different families was not considered. Based on the existing literature, this paper tries to make contributions to the above four aspects.

2.2 Theoretical hypothesis of the impact of digital inclusive finance on consumption

First of all, consumption, as an important part of economic development, has always been a key issue in economic research. Classical consumption theories, such as the persistent income hypothesis (Weil, 1993), the life cycle theory (Ando&Modigliani, 1963) and the random walk theory (Hall, 1978), examine the determinants of consumption from the perspective of intertemporal smooth consumption. With the deepening of research, it can be found that there are many constraints in life, making it difficult for micro subjects to achieve intertemporal smooth consumption, and many consumption determinants have gradually developed: liquidity constraints (McCallum&Goodfriend, 1986), macroeconomic characteristics (Modigliani&Cao, 2004), cultural factors (Sun et al, 2014), individual consumption habits, uncertain expectations Risk preference factor (Havranek et al, 2017; Zhang Xun et al, 2020; Zhang et al, 2021), debt level factor (Nguyen, 2021). Recently, many researches have systematically sorted out the theoretical mechanism of digital inclusive finance on household consumption, such as Yi Xingjian and Zhou Li (2018), Li et al (2020), who believe that the main mechanisms are the transformation of consumption structure, improvement of payment convenience, increase of online shopping frequency and reduction of liquidity constraints. Therefore, the first research hypothesis of this paper is proposed:

H1: The development of digital inclusive finance helps to improve the consumption level of residents.

Secondly, based on the existing literature, it can be summarized that the role mechanism of digital inclusive finance development on consumption promotion is mainly to ease liquidity constraints, improve payment convenience and improve financial literacy. The details are as follows: First, digital inclusive finance provides funds, easing liquidity constraints for groups lacking funds, helping them achieve smooth consumption, and thus improving consumption (Guo Feng et al., 2016). Second, digital inclusive finance has broken through the shackles of the physical environment of traditional offline transactions, and transferred offline businesses to "online processing", enabling residents to quickly open accounts and credit transactions through mobile phones, increasing family financing convenience. Appropriate consumer credit products can be selected through Alipay, JD, WeChat and other mobile apps, improving consumption levels (Yang Bo et al., 2020). Third, digital inclusive finance affects residents' consumption by improving financial literacy. On the one hand, improving financial literacy helps to improve the access to family financial information, understand how to use financial products to smooth consumption, and use credit to improve consumption. On the other hand, the improvement of financial literacy has improved family risk attitude, increased their risk bearing level (McCallum&Goodfriend, 1986), and thus promoted the improvement of residents' consumption level. Based on this, the following three hypotheses are proposed:

H2: The development of digital inclusive finance improves the consumption level of residents by easing liquidity constraints.

H3: Digital inclusive financial development increases residents' consumption level by improving financial literacy.

H4: The development of digital inclusive finance improves the consumption level of

residents by improving the convenience of payment.

2.3 Consumption theory and its influencing factors

Since the 1930s, consumption theory has roughly gone through four stages of development (Zhu Guolin, 2002),

The first stage is the absolute income hypothesis put forward by Keynes in 1936. He believes that the current income of consumers positively determines the current consumption level, but there is a law of diminishing marginal consumption. The second stage is represented by Duesenbery's relative income theory in 1949, Friedman's permanent income theory in 1957, and Modigliani's life cycle theory. They believe that consumers' current consumption level depends on their past and future income at the same time, that is, consumers' accumulated income throughout their lives is the core influencing factor for consumption decisions. The third stage is the random walk hypothesis proposed by Hall in 1978. He introduced rational expectation into the hypothesis of permanent income, believing that consumption will not react to permanent income, and the change of consumption is unpredictable. The second and third stages of consumption theory are based on intertemporal consumption smoothing perspective to explore the relationship between income and consumption. However, the random walk hypothesis points out that it is difficult for the assumption of complete credit market to conform to reality, resulting in the inter temporal consumption can not be completely smooth. Therefore, the fourth stage theory proposes the liquidity constraint hypothesis and the precautionary savings hypothesis. Liquidity constraint means that the imperfect credit market will restrict the borrowing behavior of consumers, so consumers are difficult to smooth consumption. Yin Xuequn et al. (2011) found that the improvement of farmers' credit level can significantly promote the increase of farmers' consumption level. The precautionary saving hypothesis refers to that risk averse people will save for the life after retirement, but also for the prevention of future uncertain income changes, so as to maintain normal consumption in the event of negative income shocks. It can be seen that credit constraint and precautionary saving motivation are also important factors affecting residents' consumption.

The consumption theory summarizes the factors affecting consumption inequality into the following aspects. First, income inequality. Income inequality is the main factor determining consumption inequality (Jappelli and Pistaferri, 2010; Gao Fan, 2014; Yu Jingyuan and Wang Jinxiu, 2020). The widening of urban-rural income gap will aggravate the urban-rural consumption gap (Kong Xiangli and Wang Zhangming, 2013; Xu Min and Jiang Yong, 2015). The income gap will also significantly affect the consumption structure of urban and rural residents (Hu Ridong et al., 2014). Second, government revenue and expenditure behavior. Increasing government expenditure (Xu Min and Jiang Yong, 2015), basic public service expenditure (Yu Jingyuan and Wang Jinxiu, 2020) and poverty alleviation transfer payment level (Bian Shu and Zhang Mingzhi, 2021) will help to narrow the urban-rural consumption gap. On the other hand, increasing government expenditure will also squeeze out residents' consumption (Kong Xiangli and Wang Zhangming, 2013), and increasing financial expenditure will expand the urban-rural consumption gap (Sun Aijun, 2013). Third, the age structure of the population. Wu Haijiang et al. (2014) found that the urban and rural elderly dependency ratio and children dependency ratio were positively and negatively correlated with the urban-rural consumption gap respectively. Fourth, urbanization and industrial structure upgrading. The acceleration of urbanization (Gao Fan, 2014) and the upgrading of industrial structure (Xu Min and Jiang Yong, 2015) led to the "inverted U-

shaped" trend of China's urban-rural consumption gap between 1992 and 2012. Sun Aijun (2013) found that urbanization and industrial structure upgrading play a positive role in narrowing the urban-rural consumption gap. In addition, economic development (Sun Aijun, 2013), Internet technology progress (Cheng Mingwang, 2019), factor market distortion (He Chunli and Zeng Lingqiu, 2019), land financing (Zhang Jianping and Ge Yang, 2021) and new rural social endowment insurance (Zhou Guangsu, 2020) will also affect consumption inequality.

2.4 Measurement of consumption inequality

Residents' concealment of real income will lead to a higher scale of hidden income (Bai Chong'en et al., 2015), so consumption inequality can more accurately measure the difference in real welfare levels among residents than income inequality indicators (Zou Hong et al., 2013)., The existing literature mainly adopts the following methods to measure consumption inequality: First, the urban and rural consumption ratio (Sun Aijun, 2013; Gao Fan, 2013). This indicator is easy to calculate, but cannot reflect the impact of demographic factors on consumption differences. The second is to use the measurement method of income inequality for reference and use Gini coefficient (Asad and Ahmad, 2011; Zhang Haiyang and Han Xiao, 2022), Theil index (Zhang Jianping and Ge Yang, 2021), logarithmic standard deviation and quantile distance (Jappelli and Pistaferri, 2010) and other indicators to measure. Although Gini coefficient can reflect the gap between groups and within groups and has horizontal comparability, it is not sensitive to the tail population. Therefore, some researchers have constructed other more accurate measurement indicators, for example: Kakwani (1984) calculated the Gini index based on the relative deprivation curve to measure the income and wealth distribution of Australian residents (); Blundell and Etheridge (2010) used logarithmic variance to reflect the consumption difference. They found that the consumption inequality in Britain has gradually expanded since the 1980s, and gradually decreased since the 1990s (). Theil index and quantile distance bikini coefficient can better reflect the change of consumption gap among different classes (Jappelli and Pistaferri, 2010). In addition to the above indicators, there are Atkinson Index taking social welfare function into account, Canberra index based on Lorentz curve and Boneferroni index similar to Lorentz curve measurement.

2.5 Consumption effect of digital inclusive finance

A lot of research shows that the development of digital inclusive finance can improve the consumption level of residents (Yi Xingjian and Zhou Li, 2018; Zhang Xun et al., 2020; Zhang Tongjin and Cai Kuanning, 2021), narrow the consumption gap between urban and rural residents (Wei Junying et al., 2022), and reduce regional consumption inequality (Zhang Haiyang and Han Xiao, 2022). However, there are still the following arguments: (1) As far as regional heterogeneity is concerned, Yi Xingjian and Zhou Li (2018), Zhang Tongjin and Cai Kuanning (2021) found that the promotion of digital inclusive finance on household consumption is more significant in rural areas and the central and western regions. However, Zhang Xun et al. (2020) found that the development of digital inclusive finance not only did not improve the consumption of rural residents, but also expanded the gap between urban and rural consumption in western China (Wei Junying et al., 2022). (2) From the perspective of income class, the development of digital inclusive finance plays a more significant role in promoting the consumption of low-income families (Yixing Jianhe Zhouli, 2018), and can effectively reduce the consumption inequality between the middle and high income classes and high-income classes (Zhang Haiyang and Han Xiao, 2022). Li et al (2020), based on CHFS data, found that the development of digital inclusive

finance can improve the consumption level of low-income families. However, the research of Wang Xiuhua and Zhao Yaxiong (2020) shows that poor households are difficult to use digital finance to smooth the subsistence consumption due to the existence of the "digital gap". Therefore, the consumption effect of digital inclusive finance development on the poor is not significant. The above research shows that the impact of digital inclusive finance on consumption inequality and the heterogeneity effect need further analysis.

To sum up, we propose the following hypothesis:

Hypothesis 5: Compared with non inclusive target groups, the development of digital inclusive finance can reduce the overall consumption gap of residents by significantly improving the consumption level of target groups.

The development of digital inclusive finance has a positive effect on farmers' family financial market participation and risk asset allocation (Zhou Yuqing and He Guangwen, 2022). In participating in various activities in the financial market, residents' financial literacy has also been improved (Yang Bo et al., 2020). On the one hand, the enhancement of financial literacy will help families better access to financial information, understand financial terminology and identify financial risks (Dohmen, 2010), and then make better family financial decisions and reasonably plan consumption behavior. On the other hand, the improvement of financial knowledge is conducive to improving the accumulation of family wealth (Yin Zhichao and Zhang Haodong, 2017), and the level of family wealth directly determines the level of consumption. And the less family wealth, the greater the wealth creation effect of financial knowledge (Yin Zhichao and Zhang Haodong, 2017).

Based on the above analysis, we propose the following hypothesis:

Hypothesis 6: The development of digital inclusive finance can reduce the consumption gap of residents by improving the financial literacy of vulnerable groups to a greater extent.

Low income families face stronger liquidity constraints than high-income families (Dupasand Robinson, 2013), so the financial availability of low-income groups will be enhanced, and their consumption level will also be significantly improved. The development of digital inclusive finance has improved the credit availability of low-income, female, rural and midwestern samples (Yang Bo, 2020), and enhanced the financial availability of these groups (Lyman and Lauer, 2015). On the one hand, the progress of Internet technology has released the consumption demand of rural residents (Cheng Mingwang and Zhang Jiaping, 2019). For low-income groups and underdeveloped regions, the consumption level is low due to imperfect consumer markets and lack of commodity types. The development of digital inclusive finance breaks the time and space limit of transactions, and can release the consumption demand of these groups by improving the payment convenience, thus improving the consumption level of the inclusive groups. On the other hand, digital inclusive finance can reduce residents' cash demand, reduce the opportunity cost of shopping time and currency holding, and thus promote residents' consumption by improving payment convenience (Yixing Jianhe Zhouli, 2018).

Based on this, we propose the senventh hypothesis:

Hypothesis 7: The development of digital inclusive finance can reduce the consumption gap of residents by improving the payment convenience of the target groups to a greater extent.

3. Model Setting and Data Description

3.1 Data source

The main data of this paper are from the China Household Finance Survey (CHFS) carried out nationwide by the China Family Finance and Research Center of Southwestern University of Finance and Economics in 2015, 2017 and 2019. CHFS is a follow-up survey conducted every two years based on stratified sampling technology (PPS) since 2011. Up to now, six rounds of surveys have been conducted. In 2015, 37289 households in 29 provinces, municipalities, autonomous regions, 80 counties and 320 communities were interviewed, and the sample size in 2017 and 2019 increased to 40011 and 34643 households respectively. The CHFS questionnaire covers household demographic characteristics, assets and liabilities, income and consumption, insurance and security, etc. It comprehensively reflects the current situation of household consumption, thus providing a good data environment for this study.

This paper also uses two databases: (1) The 2011-2018 digital inclusive financial index jointly prepared by the Digital Finance Research Center of Peking University and Ant Financial Group based on Ant Financial's big data of digital inclusive finance. The index includes the general index of digital inclusive finance, three secondary indexes of coverage, depth of use and digital payment, and six tertiary indexes of payment, credit, insurance, monetary capital, credit and investment funds. It covers 31 provincial administrative units, 337 prefecture level cities and more than 2800 districts and counties. (2) China Regional Economic Yearbook. The yearbook provides the provincial and municipal mobile phone penetration rate, Internet penetration rate, number of mobile phone users and computer users in 2015-2019, which is the data source of the tool variables in this paper. In addition, the yearbook also includes variables such as city level population density, per capita GDP and RMB loan balance of financial institutions. (3) The longitude and latitude data of administrative units of provinces, cities and counties are from Baidu Maps.

3.2 Variable description and data processing

3.2.1 Interpreted variable

This paper uses the research method of Li et al (2020) for reference, and uses per capita household consumption as a measure of consumption level. The household consumption income ratio is also used in the robustness analysis, and eight classified consumption indicators such as food and clothing are used in the mechanism analysis.

3.2.2 Key explanatory variables

The key explanatory variable of this paper is the digital inclusive financial index, but in 2014, the digital inclusive financial index at the district and county level only provided information for 1754 districts and counties. Therefore, with reference to the research method of Yin Zhichao et al. Match the digital financial inclusive index of districts and counties in 2014, 2016 and 2018 with the CHFS data in 2015, 2017 and 2019. In order to eliminate the impact of outliers on the estimated results, this paper conducts logarithmic processing on the digital inclusive financial index according to the practice of Fu Qiuzi and Huang Yiping (2018).

3.2.3 Control variables

Based on the research of Li et al (2020) and Wu Yu et al. (2021), the control variables in this paper mainly include three categories: (1) household head characteristic variables. This group of variables should be composed of the demographic characteristics of the head of household and the level of human capital. Demographic characteristics mainly include the age of the head of household, whether he is male and whether he is married; The level of human capital is mainly

reflected by the years of education and health. (2) Family characteristic variables. It mainly includes family population structure, risk preference, uncertainty and wealth status. The family population structure is measured by the proportion of children under 16 years old, the proportion of the elderly over 65 years old and the size of the family population; Risk preference is mainly measured by two binary dummy variables, namely, whether risk preference and risk aversion. Referring to the method of Zhang Xun et al. (2020), household uncertainty is measured by three binary dummy variables, including whether there is medical insurance, whether there is pension insurance and whether there is housing fund; The wealth situation includes the logarithm of per capita net assets and per capita net income of households. In addition, this paper also controls the household registration status. (3) Regional economic characteristic variables. It is mainly measured by logarithm of population density, logarithm of GDP per capita and logarithm of RMB loan balance of financial institutions in prefecture level cities.

3.2.4 Data processing

After deleting the missing values in the samples, the final sample size for analysis was 52075, which was distributed in 377 county-level administrative units in 169 prefecture level cities of 29 provinces, municipalities and autonomous regions. The definitions, symbols, units and descriptive statistical results of main variables are shown in Table 1.

Table 1 Definition of main variables and results of descriptive statistical analysis

Variables	Signs	Obs	Mean	Std. Dev
Logarithm of per capita household consumption (yuan)	*consump*	52075	9.546	0.902
Digital financial inclusive index logarithm	*DIF*	52075	4.640	0.451
Head's age	*head_age*	52075	56.01	13.36
Male head of household (Yes=1, No=0)	*head_male*	52075	0.784	0.412
The head of household is married (Yes=1, No=0)	*head_married*	52075	0.873	0.333
Years of education of household head	*head_educ*	52075	9.172	3.902
Head of household health (Yes=1, No=0)	*head_health*	52075	0.439	0.496
Risk preference (Yes=1, No=0)	*risk_prefer*	52075	0.095	0.293
Risk neutral (Yes=1, No=0)	*risk_neutral*	52075	0.075	0.264
Risk aversion (Yes=1, No=0)	*risk_averse*	52075	0.830	0.376
Medical insurance (Yes=1, No=0)	*medical_ins*	52075	0.957	0.203
Endowment insurance (Yes=1, No=0)	*pension_ins*	52075	0.900	0.301
Housing fund (Yes=1, No=0)	*house_ins*	52075	0.288	0.453
Proportion of population under 16 years old	*fage16*	52075	0.103	0.155
Proportion of family working population	*fage_labor*	52075	0.655	0.347
Proportion of people over 65 years old	*fage65*	52075	0.242	0.362
Logarithm of family net assets (yuan)	*net_asset*	52075	12.69	1.732
Logarithm of family net income (yuan)	*inc*	52075	10.431	1.907
Total household population	*fpop*	52075	3.339	1.594
Rural (Yes=1, No=0)	*rural*	52075	0.343	0.475
Logarithm of municipal population density (person/km2)	*density*	52075	6.159	1.115
Logarithm of GDP per capita at municipal level (yuan)	*pgdp*	52075	11.02	0.592
Number of RMB deposits of municipal financial institutions (100 million yuan)	*fncd*	52075	8.532	1.549

3.3 Empirical model setting

When analyzing the impact of digital inclusive finance on household consumption, this paper mainly refers to the empirical strategy of Ran Guanghe and Tang Tao (2021). The specific model is set as follows:

$$Consumption_{ijt} = \alpha + \beta DIF_{it-1} + \gamma X_{ijt} + \lambda_i + \varepsilon_{ijt} \quad (1)$$

Among them, the explained variable $Consumption_{ijt}$ represents the per capita consumption logarithm of household t in county j in year t. DIF is the explanatory variable concerned in this paper, representing the logarithm of the county-level lagging behind the first phase of digital financial inclusion index. β is the parameter of interest in this paper. Its economic meaning is the percentage change of per capita household consumption for every 1% change of the digital inclusive financial index. X is other control variables, mainly including household characteristics, family characteristics and regional level control variables. λ Represents the family fixed effect, ε is a random disturbance term.

4. Empirical results

4.1 Benchmark results

Table 2 reports the benchmark estimation results of the impact of the improvement of digital inclusive finance on household consumption. Column (1) only controls the digital inclusive financial index and household fixed effect. The estimation results show that the coefficient of the digital inclusive financial index is 0.116, which is significant at the level of 1%. That is, for every 10% increase in the digital inclusive financial index, the per capita consumption level of households will rise by 1.2%. This shows that the development of digital inclusive finance can effectively enhance household consumption, thereby stimulating the domestic demand of microeconomic entities. This is consistent with Lai et al (2020)'s view that digital technology progress will improve residents' purchasing power. In columns (2) - (4), after adding the household characteristics, household characteristics and regional economic characteristics on the basis of the estimates in column (1), it is found that the digital inclusive financial coefficient is still significantly positive, indicating that the estimation results remain stable under different model settings.

Table 2 Benchmark results of the impact of DIF on household consumption

	Per capita consumption logarithm of households			
	(1)	(2)	(3)	(4)
DIF	0.199***	0.157***	0.102***	0.116***
	(0.043)	(0.042)	(0.030)	(0.020)
Household characteristics	NO	YES	YES	YES
Family characteristics	NO	NO	YES	YES
Regional characteristics	NO	NO	NO	YES
Family FE	YES	NO	YES	YES
N	75998	56767	52797	52075
R2	0.711	0.727	0.765	0.780

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

4.2 Endogenetic analysis

One of the main challenges faced by this paper in empirical research is endogeneity, which may come from three aspects: (1) reverse causality. The improvement of digital inclusive finance will help to improve household consumption. On the other hand, the expectation of a region's future household consumption level may affect the current development level of digital inclusive finance in the region. Although the digital inclusive financial index with a lag of one period was adopted to alleviate the problem, the reverse causality may still exist. (2) Missing variable. Although household characteristics, family characteristics, regional characteristics and household fixed effects and other variables are controlled in the benchmark analysis, there may still be unobservable factors in the random disturbance term that affect the development of digital inclusive finance and household consumption level at the same time. For example, time varying factors such as year fixed effects and regional consumption habits that do not change with households are omitted from the benchmark analysis. (3) Measurement error. When answering questions about household consumption, respondents are likely to overestimate household consumption out of the mentality of comparison, which will lead to the measured value being higher than the actual value due to unobservable human factors. The existence of endogenous problems will lead to biased OLS estimation results.

In order to alleviate the endogenous problem, the first set of instrumental variables used in this paper is the geographic distance variable, which is measured by the intersection of the spherical distance between the county where the family is located and Hangzhou City and the spherical distance between the city where the family is located and the provincial capital city and the average value of the national digital inclusive financial index. There are three reasons for selecting this tool variable: first, it meets the correlation. Although digital inclusive finance is mainly realized in online form, its expansion relies heavily on geographical and spatial features, and it is more difficult to develop as it is farther away from the provincial capital or Hangzhou (Fu Qiuzi and Huang Yiping, 2018). Secondly, it conforms to exogenesis. Although geographical distance may affect individual consumption behavior by acting on the economic environment, this impact is indirect under the premise of controlling the fixed regional effect. In addition, the time invariant spatial distance is less likely to be related to the temporary variable of residents' consumption behavior (Wu Yu et al., 2021). To sum up, the above two tool variables are ideal. In addition, this paper also refers to the research method of Li et al (2020), and selects three tool variables, including provincial Internet penetration rate, mobile phone penetration rate and smartphone penetration rate, to conduct robustness test.

Table 3 reports the specific results of tool variable regression. As shown in columns (1) - (5), the first stage regression F values are all greater than 10, indicating that there is no problem of weak instrumental variables. At the same time, the development coefficient of digital inclusive finance is significantly positive at the level of 1%, indicating that the benchmark conclusion that the development of digital inclusive finance can significantly improve household consumption level is still valid after considering the endogenous.

Table 3 Regression Results of IV

	IV estimation				
	Distance from city to provincial capital * logarithm of digital inclusive mean	County to Hangzhou distance logarithm * digital inclusive mean logarithm	Provincial Internet penetration	Provincial mobile phone penetration	Provincial smartphone penetration
	(1)	(2)	(3)	(4)	(5)
Panel A：Second stage regression					
DIF	1.305***	1.312***	0.936***	0.921***	0.929***
	(0.252)	(0.191)	(0.234)	(0.189)	(0.190)
Controls	YES	YES	YES	YES	YES
Family FE	YES	YES	YES	YES	YES
N	52,075	52,075	52075	52075	52075
R2	-0.267	-0.273	-0.022	-0.014	-0.018
Panel B：First stage regression					
IV	0.477***	0.334***	1.383***	1.789***	1.560***
	(0.083)	(0.065)	(0.344)	(0.331)	(0.291)
F-value of the first stage	33.03	26.75	16.12	29.21	28.71

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

5. Mechanism analysis

The above research shows that the development of digital inclusive finance helps to improve the consumption level of residents. How does digital inclusive finance affect household consumption? This section explains from multiple perspectives such as quantile regression, grouping regression of consumption subcategories, liquidity constraints, financial literacy and payment convenience.

5.1 Quantile regression

The development of digital finance can significantly stimulate household consumption demand, thereby improving household consumption level (Zhang Xun et al., 2020). But for households with different consumption levels, do they have the same marginal benefit from the development of digital inclusive finance? To test this proposition, the author uses quantile regression to examine the benchmark effect at the quantiles 5, 10, 25, 50, 75, 90 and 95. As shown

in Table 4, the digital inclusive financial development index is significantly positive at the level of 1%, and with the improvement of per capita household consumption, the regression coefficient of the variables concerned gradually decreases from 0.118 to 0.114. This shows that the main beneficiaries of the positive consumption effect of digital inclusive finance development are families with lower consumption levels. This is consistent with the original intention of inclusive finance to reduce the transaction cost and threshold of financial services, improve the coverage of financial services and thus improve the financial availability of low-income (or consumer) households.

Table 4 Quantile regression results

	Per capita consumption logarithm of households						
	q5	q10	q25	q50	q75	q90	q95
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DIF	0.118***	0.117***	0.117***	0.116***	0.114***	0.114***	0.114***
	(0.044)	(0.037)	(0.035)	(0.019)	(0.018)	(0.020)	(0.025)
Controls	YES	YES	YES	YES	YES	YES	YES
Family FE	YES	YES	YES	YES	YES	YES	YES
N	86637	86637	86637	86637	86637	86637	86637

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

5.2 The Mechanism Test of Different Consumption Categories

Consumption can be divided into different sub items according to expenditure destination. Does the development of digital inclusive finance have the same marginal impact on different consumption categories? For this reason, the author further subdivides consumption into eight secondary classifications, including food, clothing, housing, household equipment, medical care, transportation, education and other expenditures, according to the announcement of Classified Expenditure on Residents' Consumption (2013) issued by the National Bureau of Statistics in 2013, and uses the benchmark model to investigate the heterogeneity of sub item consumption. The results in Table 5 show that the development of digital inclusive finance mainly improves the overall consumption level of households by increasing household spending on food, household equipment, transportation and other services. Other expenditures include hotel accommodation, cultural entertainment and other financial services. Its economic meaning is that inclusive finance enables residents to have surplus funds to invest in spiritual enjoyment after meeting basic needs such as food, clothing, housing and transportation, which is consistent with the expectation of Maslow's demand level theory.

Table 5 Grouping Regression Results by Consumption Category

	Food expenditure	clothing expenditure	housing expenditure	household equipment	medical expenditure	transportation expenditure	education expenditure	other expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DIF	0.164***	0.041	-0.017	0.158*	-0.083	0.197***	0.222	0.735***
	(0.035)	(0.071)	(0.040)	(0.082)	(0.103)	(0.041)	(0.152)	(0.097)
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Family FE	YES	YES	YES	YES	YES	YES	YES	YES
N	50707	52075	52075	52075	52075	52075	52075	43740
R2	0.687	0.647	0.639	0.606	0.592	0.699	0.681	0.512

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

5.3 Mechanism Analysis Based on Mediation Effect Model

Digital inclusive finance has become an important direction of financial industry development in all countries around the world. On the basis of improving inclusive finance practice by traditional financial institutions, it further improves the audience of financial services based on big data, information technology, cloud computing and other Internet technologies, thus reducing the financing constraints of economic activity subjects (Guo Feng et al., 2016). Can the digital inclusive financial index release residents' consumption vitality by reducing liquidity constraints? In order to test this mechanism, the author refers to the research method of Wang et al (2021), and takes whether a family holds an activated credit card as the mechanism variable. The value of the activated credit card not held by the family is 1, otherwise it is 0. As shown in the result of column (1) of Table 6, the intermediary variable is significantly negative and the digital inclusive finance coefficient decreases, indicating that the development of digital inclusive finance can release the household financing ability by easing household liquidity constraints, thus improving the actual consumption level of households. Sobel test results show that the mediation effect is small, which only explains 3.4% of the benchmark results.

In the process of popularizing low-income or low educated groups, inclusive finance, which relies on the progress of Internet technology, has created a cheap financial environment with low transaction costs and time costs, such as flower, loan and electronic payment. In order to obtain the convenience brought by these financial services, the public needs to learn relevant knowledge first (Yang Bo et al., 2020). Therefore, the author believes that the development of digital inclusive finance is likely to improve household financial literacy, thereby improving their consumption level. This paper is tested by reference to the research methods of Yin Zhichao et al. (2014). Specifically, based on the respondents' understanding of interest rate, inflation and investment risk, two binary dummy variables are constructed: whether the answer is correct and whether the answer is direct. Then, factor analysis is carried out on these six dummy variables to construct the indicator of financial literacy. The corresponding analysis results are shown in Column (2) of Table 6. The financial literacy coefficient is significantly positive at the level of 1% and the digital inclusive financial development coefficient decreases significantly, indicating that the intermediary effect is valid. Sobel test results show that the development of digital inclusive finance can improve household consumption level by improving residents' financial literacy, and the size of intermediary effect is as high as 56.9%.

In addition, after introducing money into the consumer utility function in the purchase time model, it is found that the use of money can increase the leisure time of residents by reducing the transaction time of residents and improving the convenience of payment, which is conducive to improving the level of consumer utility (McCallum&Goodfriend, 1986). The digital inclusive finance based on Internet technology has broken through the time and space limitations of traditional financial outlets, greatly improving the convenience of residents' payment. Can digital inclusive finance improve household consumption by improving payment convenience? In order to test this mechanism, this paper refers to the research methods of Yi Xingjian and Zhou Li

(2018), and uses Internet shopping to measure payment convenience. If the family had online shopping experience last month, the value is 1; otherwise, it is 0. The regression results in column (3) of Table 6 show that the online shopping coefficient is significantly positive and the digital inclusive finance development coefficient decreases, indicating that the intermediary effect exists. Sobel test results show that the development of digital inclusive finance can improve household consumption level by improving payment convenience, and the intermediary effect is 8.6%.

Table 6 Regression results of intermediary effect model

	Per capita consumption logarithm of households		
	(1)	(2)	(3)
DIF	0.112***	0.050***	0.106***
	(0.020)	(0.015)	(0.020)
No credit card	-0.119***		
	(0.016)		
Financial literacy		0.002***	
		(0.001)	
Online shopping			0.159***
			(0.017)
Controls	YES	YES	YES
Family FE	YES	YES	YES
N	51558	35362	50956
R2	0.782	0.802	0.784

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

6. Heterogeneity analysis

This section explains how the development of digital inclusive finance can promote residents' consumption from the perspective of heterogeneity analysis. Mainly based on the grouping regression method, the analysis is carried out from such dimensions as the education level of the head of household, urban and rural areas and regions.

6.1 Heterogeneity of household heads' educational level groups

In the era of knowledge economy, human capital, as a new factor of production, not only has an important impact on the level and quality of economic output, but also is one of the important determinants of financial market access for microeconomic entities (Fleisher et al, 2010; Thakurata, 2021). A natural question is, will the difference in human capital of household heads affect the marginal effect of digital inclusive finance on household consumption? In order to test this proposition, the author uses the years of education to measure the human capital of household heads, and divides it into three groups according to the sample distribution: primary school and below, junior high school and senior high school and above, and re estimates them. The regression results are reported in columns (1) - (3) of Table 7. The results show that the main beneficiaries of the positive consumption effect of digital inclusive finance are the households whose heads of households have high school education or above. A possible explanation is that the more educated

people are, the richer their knowledge reserves are, and the faster and stronger their receptivity to new things (such as Alipay and Huabei) is (Ko ç et al, 2016), which leads to a more significant positive consumption effect of the development of digital inclusive finance on this group of people.

Table 7 Regression results grouped by age and education level of head of household

	Education level of household heads		
	Primary school and below	junior high school	High school and above
	(5)	(6)	(7)
DIF	0.086***	0.111***	0.153***
	(0.018)	(0.029)	(0.023)
Controls	YES	YES	YES
Family FE	YES	YES	YES
N	13231	14528	15002
R2	0.719	0.754	0.777

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

6.2 Urban-rural heterogeneity

China's urban-rural dual economic structure is mainly characterized by the coexistence of urban industrial economy and rural agricultural production (Cheng&Selden, 1994). Digital inclusive finance may also show significant urban-rural differences in the promotion process. Therefore, this paper divides the samples into urban and rural areas and re estimates them. As shown in the results of columns (1) - (2) of Table 8, the marginal benefit of rural households from the positive consumption effect of digital inclusive finance is significantly greater than that of urban households. One possible explanation is that financial resources are mainly concentrated in urban areas and relatively scarce in rural areas. According to the law of diminishing marginal returns, under the premise of equal financial resource allocation, rural households should have greater returns (Yi Xingjian, Zhou Li, 2018). This also fits one of the purposes of digital finance popularization: to improve the allocation efficiency of financial resources between urban and rural areas and reduce financial exclusion from rural areas.

6.3 Regional heterogeneity

The promotion of digital inclusive finance relies on the popularization of Internet technology. The altitude of China is gradually rising from the east to the west, and the terrain is gradually complex. Limited by geographical conditions, the cost of Internet and information technology popularization is also increasing (Wu Yu et al., 2021). Is there regional heterogeneity in the promotion effect of digital inclusive finance on consumption? To test this proposition, this paper divides all provinces in China into three regions in the east, west, and east, and conducts grouping regression. The results are shown in columns (3) - (5) of Table 8. The results show that digital inclusive finance plays a more marginal role in promoting household consumption in the central and western regions. This may be due to the flat terrain of the eastern region and the earlier and

better economic and financial development; In the central and western regions, the high altitude and sparsely populated areas lead to the slow development of the formal financial market (Li et al, 2020). As a result, the development of digital inclusive finance has a more significant promotion effect on residents' consumption in the central and western regions.

Table 8 Regression results grouped by urban and rural areas and regions

	Urban and rural areas		Subregions		
	Rural	Urban	Eastern	Middle	Western
	(1)	(2)	(3)	(4)	(5)
DIF	0.126***	0.116***	0.002	0.156***	0.137***
	(0.022)	(0.024)	(0.049)	(0.028)	(0.022)
Controls	YES	YES	YES	YES	YES
Family FE	YES	YES	YES	YES	YES
N	17601	33901	11296	15220	25559
R2	0.689	0.770	0.773	0.759	0.781

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

7. Robustness test

In order to verify the robustness of the benchmark results, this paper conducts a series of robustness tests. First, change the method of measuring the interpreted variable and the concerned variable. The per capita consumption level of households is an absolute indicator, which cannot fully describe the impact of the development of digital inclusive finance on the relative consumption level of households. Therefore, this paper uses household consumption rate, that is, the proportion of household consumption in income, as the new explained variable (Li et al, 2020). At the same time, the per capita consumption of households shows a non normal distribution, which may lead to a serious error in the OLS estimates due to the influence of outliers. Therefore, referring to the research method of Schindler and Westcott (2021), inverse Hyperbol ic Transformation (IHS) is performed on the explained variable. The digital inclusive financial index also gives a more detailed description of the development of regional digital inclusive finance from three sub dimensions: coverage width, use depth and digital level. Therefore, this paper will replace the explanatory variables with household consumption rate and per capita household consumption after IHS transformation, and focus on replacing the explanatory variables with three secondary classification indicators and re estimating. Second, change the model settings. In this paper, the OLS model that controls urban fixed effects, the panel data random effects model and the fixed effects model that conducts cluster standard error adjustment at the county level are used to re estimate. Finally, replace the regression sample. The outliers in the continuous variables may cause errors in the estimation results. Therefore, this paper deletes the first and last 1% samples of continuous variables, such as per capita household consumption, per capita household net assets,

per capita household net income, per capita GDP at the municipal level and RMB deposits of municipal financial institutions. Secondly, due to the serious regional development inequality in China, it may lead to a large spatial difference in the development of digital inclusive finance, so this paper excludes the samples of four municipalities directly under the Central Government. The households with the lowest per capita consumption may have a stronger marginal response to digital financial inclusion. Therefore, Henan Province, Hebei Province and Shanxi Province with the lowest per capita consumption level are excluded from the sample. In addition, because unbalanced panel data fails to consider whether the reason for family withdrawal from the sample is related to the random disturbance term, it may cause error in the estimation results. For this purpose, this paper uses balanced panel data to re estimate. The above regression results show that the symbols and significance of the variables of interest have not changed, thus verifying the robustness of the benchmark results.

8. Extended analysis

The progress of financial technology can improve the family welfare by increasing the availability of loans and consumption level, and at the same time, it can enable families to smoothly carry out intertemporal consumption. However, there is also evidence that the progress of financial science and technology may also bring serious negative effects, such as inducing households to consume excessively and causing their borrowing to exceed the load range (Agarwal&Chua, 2020). Then, will the development of digital inclusive finance lead to excessive household consumption? Overconsumption of residents is not only related to their own consumption preferences, but also depends on household income and assets. Therefore, this paper refers to the practice of the above scholars, and sets three dummy variables to reflect whether families have excessive consumption behavior. If the household consumption income ratio exceeds the 90th, 95th or 99th percentile of the analysis sample, the value is 1; otherwise, it is 0. The results of re estimation after replacing the explanatory variables with consumption income are reported in Table 9. The results of columns (1) - (3) show that the development coefficient of digital inclusive finance is not significant. This shows that digital inclusive finance has not induced residents to consume excessively while improving household consumption level.

Table 9 Impact of DIF on household over consumption

	Whether households consume excessively		
	q90	q95	q99
	(2)	(3)	(4)
DIF	0.006	-0.001	-0.003
	(0.005)	(0.004)	(0.003)
Controls	YES	YES	YES
Family FE	YES	YES	YES
N	52075	52075	52075
R2	0.718	0.747	0.800

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

With the increasing progress of information technology, residents of different ages may show different risk preferences and feedback on digital inclusive finance due to differences in

educational background, working environment and social experience (Huang Qian et al., 2021). Although on the whole, digital inclusive finance has not led to excessive consumption of residents, does it have a heterogeneous impact on different age groups? Therefore, according to the age distribution of household heads, this paper divides the samples into four groups: 40 and below, (40,50], (50,60] and 60 and above, and conducts sub sample regression. The results are reported in Table 10. In column (1), the development coefficient of digital inclusive finance is significantly positive and significant at the 10% level, which indicates that the development of digital inclusive finance has induced excessive consumption behavior of young people. The coefficient of the variables concerned in columns (2) - (4) is negative, which indicates that the development of digital inclusive finance helps to reduce the risk of over consumption of middle-aged and elderly people, but the results are not statistically significant. One possible explanation is that young people have low income when they first work and are under pressure to buy large fixed assets such as RV, so they have huge consumption demand. In the process of promoting digital inclusive finance relying on smart phones, computers and other devices, young people are more likely to learn how to use relevant equipment and software to borrow and consume. However, in a more relaxed and convenient digital inclusive financial environment, it is difficult for them to control their own consumption desire, or even excessive consumption.

Table 10 The impact of DIF on household over consumption - heterogeneity by age

	Whether households consume excessively			
	[0, 40）	[40, 50）	[50, 60）	[60, 120]
	(1)	(2)	(3)	(4)
DIF	0.022*	-0.004	-0.002	-0.003
	(0.012)	(0.006)	(0.006)	(0.004)
Controls	YES	YES	YES	YES
Family FE	YES	YES	YES	YES
N	4769	9454	11700	18956
R2	0.774	0.759	0.784	0.722

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9. The impact of digital finance on consumption inequality

9.1 Data, Variables and Models

9.1.1 Data source

The main data of this paper are from the three rounds of China Household Finance Survey (CHFS) carried out nationwide by the China Household Finance Survey and Research Center of Southwestern University of Finance and Economics in 2015, 2017 and 2019. CHFS has been followed up every two years since it was first carried out in 2011. After ranking the per capita GDP of each region, the CHFS team used the three-stage hierarchical scale scaling (PPS) technology to sample, and the

samples obtained are representative of national, provincial and sub provincial cities. In 2015, the data covered 1396 villages/neighborhood committees in 351 districts and counties of 29 provinces; In 2017, the data covered 1428 villages/neighborhood committees in 355 districts and counties of 29 provinces; In 2019, the data covered 1364 villages/neighborhood committees in 340 districts and counties of 29 provinces. The CHFS questionnaire not only covers family demographic characteristics, assets and liabilities, income and expenditure, insurance and security, but also comprehensively reflects the main economic activities and financial behaviors of families. The survey also collects itemized consumption data of families in terms of food, clothing, housing and transportation, providing a good data environment for this study.

9.1.2 Variable Description

(1) Interpreted variable. This paper uses the research methods of Fernando (2020), Luanjiang et al. (2021) for reference, and uses the RIF value of Gini coefficient calculated by the family per capita consumption logarithm to measure the residents' consumption gap. RIF is defined on the basis of influence function (IF) to measure the impact of a small change in a sample on the overall statistics. The specific definitions of the above indicators are as follows:

$$IF\{y_i, v(F_y)\} = \lim_{n\to\infty} \frac{v\{(1-\varepsilon)F_y + \varepsilon H_{y_i}\}}{\varepsilon} = \frac{\partial F_y \to H_{y_i}}{\partial \varepsilon}$$

$$RIF\{y_i, v(F_y)\} = IF\{y_i, v(F_y)\} + v(F_y) \quad (1)$$

Where, F_y is the original cumulative distribution function of random variable Y, H_{y_i} is only available in the distribution function of value taken at y_i, $v(F_y)$ is the corresponding overall statistics, such as Gini coefficient, standard deviation, quantile distance and other indicators. RIF means that the approximate value of the overall statistics after considering the influence at y_i.

(2) Key explanatory variables. The key explanatory variable of this paper is the development level of digital inclusive finance. With reference to the research methods of Fu Qiuzi, Huang Yiping (2018) and Li et al (2020), the logarithm of the digital inclusive finance development index is used to measure the development level of regional digital inclusive finance. The index is compiled by the Digital Finance Research Center of Peking University and the research group of Ant Financial Services Group, based on the connotation of digital inclusive finance and the massive data generated when individuals use Alipay related businesses (such as Huabei, Yu'ebao, Zhima credit mortgage free and QR code payment). The index covers more than 2800 county-level administrative units in 337 prefecture level cities of 31 provinces, municipalities and autonomous regions in China, and is the most widely used indicator system in studying the

economic effects of digital inclusive finance development. The index is composed of a general index and three secondary indexes (coverage, depth of use and digitalization). The depth of use also includes six tertiary indicators, including digital payment business, monetary fund business, credit business, insurance business, investment business and credit business (please refer to the study of Guo Feng et al. (2020) for the complete compilation process of the index). In order to alleviate the reverse causality problem, this paper uses the logarithm of the digital inclusive financial index at the county level, which lags behind by one period, to measure the development level of digital inclusive finance at the county level, that is, match the digital inclusive financial index in 2014, 2016 and 2018 with the CHFS data in 2015, 2017 and 2019 respectively.

(3) Other control variables. Referring to the practices of Yi Xingjian and Zhou Li (2018) and Li et al (2020), the control variables selected in this study mainly include household characteristics, family characteristics and regional characteristics. The household head characteristic variables are mainly measured by the household head's age, gender, marital status, years of education and health status. Family characteristic variables mainly include population structure, family wealth, uncertainty and risk attitude. The population structure mainly includes the family size, child dependency ratio (children aged 16 and below) and elderly dependency ratio (elderly aged 65 and above); Family wealth is mainly measured by logarithm of per capita net income and logarithm of per capita net assets; Referring to the practice of Zhang Xun et al. (2020), the uncertainty faced by families is measured by three binary dummy variables: whether families participate in pension reimbursement, whether they participate in medical insurance and whether they have housing fund; The risk attitude refers to the practice of Yin Zhichao et al Answer to one question. Specifically, projects with high risk and high return and projects with slightly higher risk and slightly higher return are defined as risk appetite, projects with average risk and average return are defined as risk neutral, and projects with slightly lower risk and slightly lower return and those unwilling to bear any risk are defined as risk aversion. In addition, family characteristics also include whether the family is registered as a rural household. Regional characteristic variables mainly include population density of prefecture level cities, logarithm of per capita GDP and logarithm of RMB deposit balance of financial institutions to control the interference of regional population, economic and financial development level and other factors. In all empirical models, this paper controls household and year fixed effects. After eliminating the missing values, the final sample for analysis is composed of 52075 households. The symbols, definitions and descriptive statistical results of the main variables are shown in Table 11.

Table 11 Descriptive Statistical Analysis Results of Main Variables

Variables	Signs	Obs	Mean	Std. Dev
RIF value of consumption Gini coefficient	*cons_gini*	52075	0.053	0.041
Digital inclusive financial index	*dif_index*	52075	4.640	0.451
Head's age	*head_age*	52075	56.01	13.36
Male head of household (male=1)	*head_male*	52075	0.784	0.412
The head of household is married (married=1)	*head_married*	52075	0.873	0.333
Years of education of household head	*head_educ*	52075	9.172	3.902
Head of household health (health=1)	*head_health*	52075	0.439	0.496
Total household population	*fpop*	52075	3.339	1.594
Proportion of population under 16 years old	*fage16*	52075	0.103	0.155
Proportion of family working population	*fage_labor*	52075	0.655	0.347
Proportion of people over 65 years old	*fage65*	52075	0.242	0.362
Family net assets logarithm	*net_asset*	52075	12.69	1.732
Family net income logarithm	*inc*	52075	10.431	1.907
With endowment insurance (with insurance=1)	*med_ins*	52075	0.957	0.203
With medical insurance (with medical insurance=1)	*old_ins*	52075	0.900	0.301
With housing provident fund (with provident fund=1)	*hou_ins*	52075	0.288	0.453
Risk appetite (appetite=1)	*risk_prefer*	52075	0.095	0.293
Risk neutral (neutral=1)	*risk_neutral*	52075	0.075	0.264
Risk aversion (aversion=1)	*risk_aversion*	52075	0.830	0.376
Rural (rural=1)	*rural*	52075	0.343	0.475
Logarithm of municipal population density	*density*	52075	6.159	1.115
Per capita GDP at municipal level	*pgdp*	52075	11.02	0.592
Number of RMB deposits of municipal financial institutions	*fncd*	52075	8.532	1.549

9.1.3 Model Settings

From equation (1), it can be deduced that the unconditional expectation of RIF is equal to the corresponding statistic, namely:

$$\int RIF\{y_i, v(F_y)\} = v(F_y)$$

Therefore, if RIF is taken as the dependent variable, the following OLS regression can be performed:

$$RIF\{y_i, v(F_y)\} = X'\beta + \varepsilon,\ E(\varepsilon) = 0$$

Then calculate the unconditional expectation for both sides of the above equation, we can get:

$$v(F_y) = E[X'\beta] + E(\varepsilon) = \overline{X'}\beta \quad (2)$$

The measurement method described by (2) is referred to as RIF regression, The meaning of parameter β_k is that under the premise that other conditions remain unchanged, when the mean value of x_k increases by one unit, the corresponding change amplitude of the overall statistic v of y is β_k. The advantage of RIF regression is that it can estimate the marginal impact of the mean change of key explanatory variables on the overall statistics while retaining the information of individual samples.

$$gini\_RIF_{ijt} = \beta_0 + \delta * dif\_index_{j,t-1} + X\beta + a_i + \lambda_t + \varepsilon_{ijt} \quad (3)$$

Therefore, combining the advantages of RIF regression and referring to the consumption decision model in the research of Zhang Xun et al. (2019) and Li et al. (2020), the measurement model in this paper is set as follows:

Among them, the interpreted variable $gini\_RIF_{ijt}$ refers to the RIF value of Gini coefficient calculated according to the per capita consumption logarithm of j county of household i, which measures the inequality of consumption among residents nationwide. Key explanatory variable di $dif\_index_{j,t-1}$ indicates the development level of digital inclusive finance at the county level lagging behind by one period. The parameters of interest are δ, its economic meaning is the marginal change percentage of residents' consumption inequality when the development level of digital inclusive finance increases by 1%. X refers to other factors that may affect residents' consumption gap, including household characteristics, household characteristics and the economic and financial development level of the city where the household is located. a_i and λ_t represents family and year fixed effects respectively, ε_{ijt} is a random disturbance term.

9.2 Empirical results

9.2.1 Benchmark results

Table 12 reports the benchmark results of the impact of digital inclusive finance development on residents' consumption gap. Based on the measurement model (3), column (1) only controls the digital inclusive financial index, household fixed effect and year fixed effect. The results show that the estimated coefficient of the digital inclusive financial development index is -0.011, which is significant at the 1% level. This shows that the Gini coefficient of residents' consumption will decrease by 0.11% for every 10% increase in the development level of county digital inclusive finance, that is, the inclusiveness of digital inclusive finance development in consumption is mainly reflected in narrowing the consumption gap of residents. Columns (2) - (4) gradually control the characteristics of the head of household, family and region on this basis. The result shows that the estimated coefficient of digital inclusive finance drops slightly to -0.01, which not only means that other factors have less impact on the consumer gap, but also verifies the robustness of the benchmark results.

Table 12 The gap between DIF and residents' consumption

	Explained variable: RIF value of consumption Gini coefficient				
	OLS				IV
	(1)	(2)	(3)	(4)	(5)
DIF	-0.011***	-0.011***	-0.010***	-0.010***	-0.064***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.017)
head_age		-0.000	0.000	0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)
head_male		0.001	-0.000	-0.000	-0.001
		(0.001)	(0.001)	(0.001)	(0.001)
head_married		-0.002	-0.005***	-0.005***	-0.005***
		(0.002)	(0.002)	(0.002)	(0.002)
head_educ		-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)
head_health		0.000	0.001	0.001	0.000
		(0.001)	(0.001)	(0.001)	(0.001)
fpop			0.006***	0.006***	0.005***
			(0.001)	(0.001)	(0.001)
fage16			-0.008**	-0.008**	-0.008*
			(0.004)	(0.004)	(0.004)
fage65			-0.004*	-0.004**	-0.005***
			(0.002)	(0.002)	(0.002)
net_asset			-0.001**	-0.001**	-0.001***
			(0.000)	(0.000)	(0.000)
inc			-0.001***	-0.001***	-0.001***
			(0.000)	(0.000)	(0.000)
old_ins			-0.001	-0.001	-0.000
			(0.001)	(0.001)	(0.001)
med_ins			-0.000	-0.000	-0.003**
			(0.001)	(0.001)	(0.001)
hou_ins			-0.004***	-0.004***	-0.003**

			(0.001)	(0.001)	(0.001)
risk_prefer			0.001	0.001	0.001
			(0.002)	(0.002)	(0.002)
risk_averse			0.001	0.001	0.001
			(0.001)	(0.001)	(0.002)
rural			0.002	0.001	-0.002
			(0.004)	(0.005)	(0.004)
density				0.023	-0.034
				(0.031)	(0.040)
pgdp				0.001	0.002
				(0.009)	(0.011)
fncd				-0.019*	-0.013
				(0.011)	(0.012)
Household FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
IV					-0.005***
					(0.001)
F-value of the first stage					23.32
N	75998	56767	52797	52075	52075
R2	0.573	0.597	0.611	0.613	0.608

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.2.2 Endogenetic analysis

Although in the benchmark analysis, this paper uses the digital inclusive financial development index that lags behind one period to alleviate the reverse causality problem, and uses the panel data two-way fixed effect model to overcome the problem of missing variables, the endogenous problem may still exist. Its sources are: (1) reverse causality. Alipay team may design and develop businesses with updated digital inclusive finance functions (such as QR code payment, fingerprint payment and face recognition) based on the expectation of future consumption differences among residents in various regions. (2) Missing variable. Due to data limitations, this paper omits the characteristics of community and county level changes over time in the research process, such as the number of community banks reflecting the strength of village/social traditional financial services. However, these variables may be related to the development level of digital inclusive finance and regional consumption differences at the same time, thus leading to error in the estimation results.

This paper refers to the practice of Fu Qiuzi and Huang Yiping (2020), and adopts the instrumental variable method to overcome the endogenous problem. The tool variable selected is the spherical distance between the city where the family is located and the provincial capital city. The tool variable conforms to the correlation and exogenous conditions of IV and is an ideal tool variable. First of all, the farther the spherical distance between the city where the family is located and the provincial capital city, the lower the development level of digital inclusive finance in the county where the family is located, that is, IV is related to the core explanatory variable. Secondly, the spherical distance between the city where the family is located and the provincial capital city

is a geographical distance indicator, which has little to do with the consumption gap, and the exogenous conditions can be met. In the empirical process, in order to reduce the impact of outliers on the estimated results, this paper conducts logarithmic processing on the instrumental variables. Finally, because there is no ready-made Stata package that can be directly used for RIF regression tool variable regression. Therefore, this paper estimates the coefficients in two parts according to the idea of instrumental variable regression. However, this will lead to inconsistent standard errors of parameter estimation. Therefore, we adopt bootstrap to correct the standard errors of parameter estimation by repeating benchmark analysis 500 times.

The regression results of instrumental variables are shown in column (5) of Table 12. It can be seen from the IV estimation coefficient that the development level of digital inclusive finance is significantly negatively correlated with the spherical distance between prefecture level cities and provincial capital cities, which is in line with expectations. The F statistic estimated in the first stage is 23.32, which is significantly greater than the critical value of 10, thus eliminating the possibility of the existence of weak instrumental variables. At the same time, the estimated development level of digital inclusive finance is 0.064, which is significant at the 1% level. This shows that every 10% increase in the development of digital inclusive finance will reduce the consumption gap by 0.64%.

9.2.3 Robustness test

In addition, a lot of robustness tests have been carried out. First, replace the interpreted variable. There are many indicators to measure the degree of inequality. In addition to Gini coefficient and Thiel index, there are also indicators such as standard error and quantile distance (Xu Shu et al., 2020). In order to verify the robustness of the benchmark results, we will replace the explanatory variables with the RIF value of the standard deviation calculated according to the logarithm of household per capita consumption, the RIF value of the 90th percentile and the 10th percentile as the interval, the RIF value of the 95th percentile and the 5th percentile as the interval, and the RIF value of the 99th percentile and the 1st percentile as the interval. The results are summarized in columns (1) - (4) of Table 13. The results show that the estimation coefficient of the variables of interest is still significant at the level of 1%, which further verifies the robustness of the benchmark results.

Table 13 Substitution of interpreted variables

	Standard deviation	Quantile distance		
	std	q90-q10	q95-q5	q99-q1
	(1)	(2)	(3)	(4)
DIF	-0.267***	-0.715***	-0.884***	-1.085***
	(0.038)	(0.115)	(0.124)	(0.195)
Controls	YES	YES	YES	YES
Household FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	52075	52075	52075	52075
R2	0.581	0.553	0.539	0.489

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

Secondly, replace the regression samples. The extreme values in the continuous variables may lead to error in the estimation results. Therefore, this paper deletes the first and last 1%

samples of the continuous variables, such as the logarithm of per capita household consumption, the logarithm of digital inclusive financial index, the logarithm of per capita household net assets, the logarithm of per capita household net income, the logarithm of per capita GDP in prefecture level cities and the logarithm of per capita currency deposits in prefecture level cities. The corresponding regression results are shown in column (1) of Table 14. Regions with higher economic development level, such as municipalities directly under the Central Government, may learn about the information related to digital inclusive finance earlier, which may lead to error in the estimation results. For this reason, this paper deleted four municipalities' samples and re estimated model (3). The results are reported in column (2) of Table 14. The explanatory variable in this paper is the RIF value of the Gini coefficient of consumption. If the region with the lowest per capita consumption level is included in the sample, it may lead to biased estimation results. For this reason, the sample of Henan, Hebei and Shanxi provinces with the lowest per capita household consumption level is deleted, and the benchmark model is re estimated. The results are shown in column (3) of Table 14. The unbalanced panel data failed to take into account the impact of sample withdrawal or entry on the estimated results, so this paper uses panel data to re estimate, and the results are reported in column (4) of Table 14.

Finally, improve the empirical model. Adolfsson et al (2019) showed that relaxing the clustering hierarchy may result in more significant estimation results. For this reason, this paper further adjusts the clustering standard error in the administrative units at the county level. The new estimation results are shown in column (5) of Table 14. The time-varying financial environment and consumption system of provinces may also affect the estimation results. Therefore, this paper further controls the interaction fixed effect between provinces and years to alleviate this problem, and the corresponding results are reported in column (6) of Table 14. The above results all show that the development of digital inclusive finance can significantly narrow the consumer gap, and the estimated results are consistent with the above.

Table 14 Changing Regression Samples and Model Settings

	Explained variable: RIF value of consumption Gini coefficient					
	Delete first and last 1%	Delete municipality	Delete the province with the lowest consumption	Balance panel	Cluster to County	Province * year FE
	(1)	(2)	(3)	(4)	(5)	(6)
DIF	-0.015***	-0.014***	-0.014***	-0.020***	-0.013***	-0.016***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Controls	YES	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Province*Year FE	NO	NO	NO	NO	NO	YES
N	45168	44161	45922	26829	52075	52075
R2	0.586	0.603	0.614	0.525	0.621	0.613

Note: In columns (1) - (4) and (6), there are cluster standard errors adjusted at the prefecture level city level, and in column (5), there are cluster standard errors adjusted at the county level.

Column (6) further controls the interactive fixed effect between provinces and years. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.3 mechanism analysis

The previous research results show that the development of digital inclusive finance helps to narrow the consumption gap of residents. How does the development of digital inclusive finance affect the consumption gap of residents? This section attempts to explain from the following perspective: the development of digital inclusive finance may affect the overall consumption gap by improving the payment convenience and financial literacy of the inclusive groups (rural, low material capital, low human capital and low financial literacy residents). In order to test the above mechanism, this paper further adds interaction items to the econometric model (3) for analysis. The model settings are as follows:

$$ln\,(consumption)_{ijt} = \beta_0 + \gamma_0 dif\_index_{j,t-1} + \gamma_1 G_{ijt} + \gamma_2 M_{ijt} + \gamma_3 dif\_index_{jt} * G_{ijt}$$
$$\gamma_4 dif\_index_{jt} * M_{ijt} + \gamma_5 G_{ijt} * M_{ijt} + \gamma_6 dif\_index_{jt} * G_{ijt} * M_{ijt} + X\beta + a_i + \lambda_t + \varepsilon_{ijt} \quad (4)$$

The subscripts i、j and t in the above formula represent family, county and year respectively. Dependent Variable $ln\,(consumption)_{ijt}$ is measured by the logarithm of per capita household consumption. G_{ijt} is a binary dummy variable, indicating whether the family is an inclusive group (rural, low material capital, low human capital and low financial literacy). M_{ijt} represents mechanism variables such as family payment convenience and financial literacy. The definitions of other variables are consistent with model (3). The parameter concerned in this paper is the coefficient of cubic interaction term γ_6. If the estimated value of the parameter is significantly positive, it indicates whether the development of digital inclusive finance can further improve the per capita consumption level of these households by improving the payment convenience or financial literacy of the inclusive households, thereby narrowing the overall consumption gap.

The development of digital inclusive finance mainly depends on the progress of information technology and Internet technology. Its original intention is to achieve the universality and preferential (also known as inclusiveness) of financial services, that is, to provide digital financial services at a lower cost for low-income, low education and rural residents excluded from traditional financial services (Zhang Xun et al., 2019). On the one hand, existing studies have proved that the development of digital inclusive finance can improve the consumption level of residents through the channel of improving payment convenience (Yixingjian, Zhouli, 2018); On the other hand, the development of digital technology has created an advanced and low transaction cost financial environment. For example, the emerging financial service formats of Alipay, such as Huabei, Jiebei and Yu'e Bao, have greatly expanded the time and space limitation and coverage of inclusive financial services. The development of financial environment brings new digital financial service methods and contents, and residents will gradually improve their financial knowledge and literacy in the process of adapting to the new environment (Yang Bo et al., 2020). The payment convenience and financial literacy of the inclusive groups may play a more significant role in reducing the overall consumption gap.

In order to verify the above conjecture, payment convenience is measured by whether residents conduct online shopping or not based on the practices of Yixingjian and Zhouli (2018). Financial literacy refers to the practice of Yin Zhichao et al. The inclusive groups refer to the practices of Zhang Xun et al. (2019) and Wu Yu et al. (2021), mainly including rural residents, low material capital (assets and income), low human capital (education level) and low financial

literacy residents. Among them, low per capita net assets, low per capita net income, low education level and low financial literacy are all defined as binary dummy variables. When the per capita net income (per capita net income, household head education level and financial literacy) of a family is less than or equal to the median of this variable, the value is 1; otherwise, the value is 0. The regression results based on the econometric model (4) are shown in Table 15. The results show that the coefficients of all three interactions in the model are significantly positive at the 5% level. The results have two meanings: first, as shown in the results of column (1), the development of digital inclusive finance can reduce the urban-rural consumption gap by increasing the online shopping frequency of rural residents, thus leading to a greater increase in their consumption level than urban residents. Secondly, the results in columns (2) - (5) show that the development of digital inclusive finance is in line with the original intention of inclusive finance, and plays a more significant role in marginal improvement of the household consumption level of the inclusive groups (low per capita net assets, low per capita net income, low education level and low financial literacy), So as to narrow the consumption gap with non inclusive groups (high per capita net assets, high per capita net income, high education level and high financial literacy).

Table 15 The payment convenience and financial literacy

	Explained variable: RIF value of consumption Gini coefficient				
	Rurak	Low assets	low-income	Low education	Low-fiinan-cial literacy
	(1)	(2)	(3)	(4)	(5)
DIF * lowfl * onshop	0.005**				
	(0.001)				
DIF * lowast * literacy		0.002***			
		(0.001)			
DIF * lowinc * literacy			0.003**		
			(0.001)		
DIF * loweduc * literacy				0.003***	
				(0.001)	
DIF * rural * literacy					0.160***
					(0.059)
Controls	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	35362	35362	35362	35362	34997
R2	0.805	0.805	0.805	0.805	0.806

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.4 Heterogeneity analysis

9.4.1 By consumption category

Due to the potential household heterogeneity, the impact of digital inclusive finance development on the consumption gap of different categories may also be heterogeneous. For this reason, this paper further divides consumption into eight categories, including food consumption,

clothing consumption, housing consumption, household equipment consumption, medical care expenditure, transportation expenditure, education expenditure and other expenditure, according to the classification standard of consumption subcategories by the National Bureau of Statistics. The regression results in Table 16 show that the narrowing effect of digital inclusive finance development on residents' consumption gap is mainly reflected in food consumption, household equipment consumption, education expenditure and other expenditures. The possible reason is that the purpose of digital finance development is to reduce the financial service access threshold for low-income or low education groups, so as to improve their consumption level (Zhang Xun et al., 2019). Limited by income and knowledge, these families may pay more attention to food, durable goods and children's education. When their available financial resources increase, they will allocate more funds to the above aspects. At the same time, this is also in line with the expectation of Maslow's hierarchy of needs theory, that is, the family will use additional funds for children's education investment while meeting the basic survival needs, thus improving the family's intergenerational human capital accumulation.

Table 16 Impact of DIF on Consumption Gap of Different Categories

	Explained variable: RIF value of consumption Gini coefficient							
	Food expenditure	clothing expenditure	housing expenditure	household equipment	medical expenditure	transportation expenditure	education expenditure	other expenditures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dif_index	-0.061***	0.003	-0.025	-0.049***	-0.031	-0.015	-0.036***	-0.013**
	(0.015)	(0.013)	(0.023)	(0.017)	(0.019)	(0.014)	(0.011)	(0.006)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
N	50707	52075	52075	52075	52075	52075	52075	43740
R2	0.492	0.596	0.468	0.467	0.491	0.466	0.611	0.497

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.4.2 Secondary index

Combining the new features of traditional finance and Internet financial services, the Digital Finance Research Center of Peking University not only provides the overall digital finance development index, but also provides three secondary indicators, including coverage width, depth of use and digital degree (Guo Feng et al., 2020). What dimensions does digital inclusive finance development use to narrow the consumer gap? Therefore, we replace the total index in model (3) with the secondary index and repeat the benchmark analysis. See Table 17 for the regression results. The results show that the three secondary indicators are significant at the level of 1%, but

as far as the regression coefficient is concerned, the depth of digital inclusive finance has the most significant role in narrowing the current consumer gap. Alipay, as a third-party payment platform under Ant Financial, was founded in 2004. At the beginning of the period, Alipay's role in boosting consumption was mainly to narrow the expenditure gap between Alipay and high consumption groups by reducing the threshold of financial services, improving the financial coverage and digital level, and significantly improving the consumption level of low consumption groups (Zhang Xun et al., 2020). However, with the progress of Internet technology and the refinement of Alipay business, the role of coverage and digital level has gradually reached the upper limit, and the improvement of the use depth of the existing inclusive groups can further tap their consumption potential, thus increasing the gap with the high consumption groups.

Table 17 Impact of secondary inclusive financial index on residents' consumption gap

	Explained variable: RIF value of consumption Gini coefficient		
	(1)	(2)	(3)
coverage_breadth	-0.013***		
	(0.002)		
usage_depth		-0.023***	
		(0.004)	
digitization_level			-0.008***
			(0.002)
Controls	YES	YES	YES
Household FE	YES	YES	YES
Year FE	YES	YES	YES
N	52075	52075	51835
R2	0.613	0.613	0.610

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.4.3 Three level index

In addition, the digital inclusive financial use depth index can be further subdivided into six three-tier indicators, including payment business, insurance business, monetary fund business, investment business, credit business and credit business. Similarly, we replace the total index in model (3) with the above three-level indicators reflecting the depth of use. Table 18 reports the corresponding results. It can be seen that credit business, payment business and monetary fund business are the main ways to narrow the consumer gap in terms of the depth of use of digital inclusive finance. This shows that the inclusive groups mainly use digital payment means more frequently, increase the scale of personal consumption loans and small and micro enterprises' business loans, and increase the investment of Yu'e Bao to boost the consumption level of low-income groups, so as to narrow the gap between them and high consumption families.

Table 18 Impact of three-level DIF index on residents' consumption gap

	Explained variable: RIF value of consumption Gini coefficient					
	(1)	(2)	(3)	(3)	(4)	(5)
payment	-0.014***					
	(0.003)					
insurance		-0.006***				
		(0.001)				
monetary_fund			-0.014***			
			(0.003)			
investment				0.006		
				(0.006)		
credit					-0.017***	
					(0.006)	
credit_investigation						-0.003
						(0.002)
Controls	YES	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	51990	51990	51990	52075	52075	33380
R2	0.612	0.613	0.613	0.609	0.609	0.624

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.4.4 Urban and rural areas and uncertainty

The impact of digital inclusive finance development on the consumption gap between rural and urban households may be heterogeneous. For this reason, this paper conducts sub sample regression on the samples of rural households and urban households, and the results are shown in columns (1) and (2) of Table 19. The digital inclusive financial development index is significantly

negative at the level of 1%, and the absolute value of the regression coefficient of urban households is significantly greater than that of rural households, which indicates that the role of digital inclusive financial development in narrowing the consumption gap within urban areas is greater than that of rural households. One possible explanation is that although the development of digital inclusive finance has improved the consumption level of rural and urban residents at the same time (Li et al, 2020). However, due to the fact that digital financial service media such as Alipay require users to have certain financial knowledge and cultural level, urban inclusive groups often have higher financial literacy and education level than rural inclusive groups. Due to the existence of this digital gap, the development of digital inclusive finance has played a greater role in reducing the consumption gap within cities.

Zhang Xun et al. (2020) found that uncertainty is an important determinant of household consumption. In the benchmark results in Table 12, the variable of housing provident fund, which reflects the uncertainty of families, has significant results. Therefore, this paper divides the sample into families with low uncertainty (with provident fund) and families with high uncertainty (without provident fund) and conducts group regression. The results are shown in columns (3) and (4) of Table 19. The results show that the development of digital inclusive finance plays a more significant role in narrowing the consumption gap within highly uncertain households. The possible reason is that the scale of expenditure of households without housing provident fund is larger, especially in housing purchase and rental. Compared with the low consumption groups in the households with provident fund, the development of digital inclusive finance has significantly increased the expenditure level of the low consumption groups in the sample without provident fund, which reflects a greater narrowing of the consumption gap. This is consistent with the original meaning of financial origin and development, that is, financial development helps residents reduce uncertainty and unnecessary losses.

Table 19 Heterogeneity between Urban and Rural Areas and Uncertainty

	Explained variable: RIF value of consumption Gini coefficient			
	Urban and rural		Uncertainty	
	Urban	Rural	With Accumulation fund	No accumulation fund
	(1)	(2)	(3)	(4)
DIF	-0.004***	-0.009***	-0.004***	-0.010***
	(0.001)	(0.002)	(0.002)	(0.002)
Controls	YES	YES	YES	YES
Household FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	17601	33901	12827	35062
R2	0.519	0.599	0.620	0.572

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.4.5 Dependent burden and age of head of household

The burden of upbringing is measured by the proportion of children aged 16 and below and the proportion of elderly people aged 65 and above, which is an important factor affecting residents' consumption level (Song Ze and Zou Hong, 2021). In order to test the heterogeneity of the impact of the development of digital inclusive finance on the consumption gap of residents with different dependency burdens, this paper divides the sample into high dependency families

and low dependency families. High dependency families are defined as families with children aged 16 and below and elderly aged 65 and above whose proportion is greater than the median, otherwise they are low dependency families. Then the benchmark analysis was carried out, and the regression results were reported in columns (1) and (2) of Table 20. The results show that the development of digital inclusive finance has significantly reduced the consumption gap among residents with high dependency burden than those with low dependency burden. The possible reason is that high dependency families tend to have larger populations. Thanks to the convenience brought by digital inclusive finance, it is easier for low consumption groups in high dependency families to spend more on children's education and elderly health care than low consumption groups in low dependency families.

The head of household has a high voice in some important family decisions (such as children's education and daily consumption), so the impact of the head of household's age structure on residents' consumption is also very important (Zhang Xun et al., 2020). In this paper, according to the age distribution of household heads, the samples are divided into three subsamples: under 50 years old, 50 to 60 years old (including 50 years old) and 60 years old and above. The results after re estimating model (3) are shown in Table 20 (3) - (5). The results show that the development of digital inclusive finance plays a more significant role in reducing the internal consumption gap of households with older heads, and the results of the retired group (people aged 60 and above) are the most significant. The possible reason is that the sample of 50 to 60 years old includes some retired female heads of households (over 55 years old), and people over 60 years old have basically retired. The income of retirees is low and relatively fixed, resulting in lower per capita consumption level of their corresponding families compared with other age groups. As the group with 50 or more heads of household includes retirees, retirement gives them more time to learn and use digital financial products such as Alipay and WeChat. As a result, the lower consumption groups in the group with older heads of household increase more, and the consumption gap in the group decreases.

Table 20 Heterogeneity of dependency burden and age structure

	Explained variable: RIF value of consumption Gini coefficient				
	Dependency burden		Head's age		
	High	Low	<50	[50,60)	>=60
	(1)	(2)	(3)	(4)	(5)
DIF	-0.012***	-0.009***	-0.007***	-0.008***	-0.013***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Controls	YES	YES	YES	YES	YES
Household FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
N	22233	22069	14076	10518	18956
R2	0.604	0.604	0.631	0.606	0.619

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

9.5 Expansion analysis

The above analysis found that the higher the development level of digital inclusive finance, the smaller the overall consumer gap. A further question is, what factors lead to the consumption inequality between groups with different levels of digital inclusive finance development? To test

this proposition, this paper first divides the development level of digital inclusive finance into high and low groups. When the digital inclusive finance index of the county where the family is located is greater than or equal to the median of the analysis sample, it is defined as a high level group, otherwise it is defined as a low level group. Then, the RIF Oaxaca Blinder decomposition method (hereinafter referred to as RIF-OB decomposition method) proposed by Rios Avila (2020) is used to decompose the inequality of consumption between groups with high and low levels of digital inclusive finance development into total composition effect and total consumption structure through RIF regression method, and then explore the relative contributions of different factors to the mean difference between groups.

$$\Delta Gini = \underbrace{\underbrace{(\overline{X_c} - \overline{X_h})\widehat{\beta_h}}_{PE} + \underbrace{\overline{X_c}(\widehat{\beta_c} - \widehat{\beta_h})}_{SE}}_{\text{结构效应}} + \underbrace{\underbrace{\overline{X_l}(\widehat{\beta_l} - \widehat{\beta_c})}_{PS} + \underbrace{(\overline{X_l} - \overline{X_c})\widehat{\beta_c}}_{RE}}_{\text{系数效应}} \quad (5)$$

Among them, c、h and l represent the high digital inclusive financial group after weight adjustment, the high digital inclusive financial group without weight adjustment and the low digital inclusive financial group without weight adjustment respectively. (5) The formula is further divided into four items: the sum of the first two items is the endowment effect, which is composed of pure composition effect and specification error in turn; The latter two items are respectively composed of pure coefficient structure and weighting error.

In order to explore the source of consumption inequality between high and low digital inclusive financial development groups, the specific results of RIF-OB measured by Gini coefficient are shown in Table 21. The results of Column (1) and Column (4) of Panel A show that the endowment effect of consumption inequality among digital inclusive financial development groups is significantly greater than the coefficient effect. The endowment effect and coefficient effect of Gini coefficient respectively explain 217% and - 117% of China's residents' consumption inequality, that is, the consumption inequality among digital inclusive financial development groups is mainly caused by the differences in characteristics of observable factors. When measuring consumption inequality by Gini coefficient, Panel B further decomposed the endowment effect and found that the four most important observable characteristics that cause the difference between high and low digital inclusive financial consumption Gini coefficient are respectively explained by the logarithmic difference between urban and rural areas, family population size, per capita net income of families and per capita GDP of prefecture level cities, and 75.9%, 22.5%, 21.7% and 14.2% of the difference.

Table 21 Consumption Gini Coefficient Gap Caused by the DIF and Its Causes

	coefficient	Std. dev	Z-statistics	contribution(%)
	(1)	(2)	(3)	(4)
Panel A: Overall results				
difference	0.0015	0.0003	4.32	100
explained	0.0033	0.0002	16.2	217
unexplained	-0.0018	0.0004	-4.48	-117
Panel B: Structure effect				
head_age	0.0000	0.0000	1.32	0.75
head_male	-0.0001	0.0001	-1.09	-1.71
head_married	-0.0001	0.0000	-3.93	-2.48
head_educ	-0.0002	0.0001	-2.78	-6.98

head_health	0.0000	0.0000	-0.33	-0.06
risk_prefer	0.0000	0.0000	2.05	0.73
risk_averse	-0.0001	0.0000	-2.47	-3.36
old_ins	0.0001	0.0000	4.49	3.98
med_ins	0.0000	0.0000	-1.91	-0.76
hou_ins	-0.0001	0.0001	-1.16	-2.44
fage16	-0.0001	0.0000	-2.5	-2.19
fage65	0.0000	0.0000	-1.18	-0.97
net_asset	0.0000	0.0001	0.18	0.72
inc	0.0007	0.0001	9.55	21.66
fpop	0.0007	0.0001	10.9	22.53
rural	0.0025	0.0001	18.5	75.89
density	0.0001	0.0002	0.34	1.74
pgdp	0.0005	0.0003	1.63	14.17
fncd	-0.0007	0.0003	-2.28	-21.21

Note: In brackets, the clustering standard error is adjusted at the urban level. *, * **** It is significant at the level of 10%, 5% and 1% respectively.

10. Summary

In the context of the rapid development of digital inclusive finance in China, the socio-economic consequences of the development of digital inclusive finance have aroused extensive thinking. This paper empirically evaluates the consumption effect of digital inclusive finance development. Based on the CHFS data of 2015, 2017 and 2019 and the county level digital inclusive financial index of Peking University in 2014, 2016 and 2018, the empirical test shows that the development of digital inclusive finance has significantly promoted residents' consumption. The benchmark results are still robust after considering endogenous issues. On the one hand, digital inclusive finance improves the consumption level of residents by improving the consumption of low consumption level households and increasing household spending on food, equipment, transportation and other services. On the other hand, digital inclusive finance can also improve household consumption level by easing household liquidity constraints, improving household financial knowledge and payment convenience, and the intermediary effect of these three mechanisms is as high as 68.9%. In addition, the development of digital inclusive finance has played a more significant role in promoting household consumption in rural areas and the central and western regions when the heads of households are young and middle-aged, the heads of households have high school education or above, and the households in rural areas and the central and western regions. Finally, this paper also finds that although the development of digital inclusive finance has boosted the overall consumption level of residents, its negative side is that it has fostered the excessive consumption behavior of young people.

Based on the above research conclusions, this paper finds that the development of digital inclusive finance has a positive role in stimulating the domestic demand of micro household

subjects and improving household consumption level. The conclusion of this paper provides empirical support for the policy objectives proposed in the report of the 19th National Congress of the Communist Party of China, such as "further improving the consumption mechanism and system, and enhancing the role of consumption in economic development". The author believes that to give full play to the positive consumption effect of digital inclusive finance, we should start from the following aspects: first, improve the administrative efficiency and approval threshold of financial services, and reduce the liquidity constraints of residents; Second, in the process of strengthening the promotion of emerging inclusive financial instruments, provide low-cost financial knowledge popularization services for residents; Third, support the R&D and upgrading of the Internet technology industry to provide more convenient online financial services; Fourth, provide relevant policy training for young and middle-aged heads of households, heads of households with high school education or above, and families in rural areas and the central and western regions. However, in the process of promoting the development of digital inclusive finance, government departments should not only take into account the personal privacy security and digital property ownership issues brought about by the development of digital inclusive finance, but also be alert to the excessive growth of leverage in the family sector and the excessive consumption of young people.

Effectively narrowing the consumer gap has important practical significance for achieving consumption equalization after boosting domestic demand. The development of digital inclusive finance based on the progress of Internet and digital technology has penetrated many aspects of residents' lives. In this context, this paper uses CHFS data in 2015, 2017 and 2019 to empirically test the impact of the development of digital inclusive finance on household consumption equality. The main conclusions are as follows: (1) The development of digital inclusive finance can effectively narrow the consumer gap, and the results are still stable after endogenous discussion and robustness test. (2) Mechanism analysis shows that, on the one hand, the development of digital inclusive finance can reduce the overall consumption gap by improving the payment convenience of rural residents to a greater extent, and the financial literacy of families with low net assets, low income, low education and low financial literacy. On the other hand, the depth of digital inclusive finance (especially credit business, payment business and monetary fund business) is the main channel to narrow the consumer gap. (3) The heterogeneity analysis shows that the development of digital inclusive finance has the most obvious effect on alleviating the gap in food, durable goods and education expenditure, as well as the internal consumption gap in cities, high uncertainty, high dependency burden and retired families. (4) The consumption inequality between high and low digital inclusive financial development groups mainly comes from endowment effect, which explains 217% of the consumption inequality among groups. Among them, household registration, household population size, per capita net income of households and regional economic development level differences are the most important four factors affecting endowment effect.

This study has important policy implications. First of all, this paper finds that the development of digital inclusive finance helps to reduce the overall consumption inequality. Policymakers should further promote the development of digital inclusive finance and effectively improve the financial welfare of residents. Secondly, this paper also finds that the development of digital inclusive finance can narrow the income gap by improving the financial literacy and payment convenience of vulnerable groups. Therefore, in the process of promoting the

development of digital inclusive finance, we should focus on the popularization and improvement of financial knowledge of vulnerable groups, and advocate the use of convenient payment methods such as two-dimensional code payment and face recognition, but we should also take into account the personal needs for privacy and security. Thirdly, in terms of the depth of use of digital inclusive finance, the government should broaden the basic businesses of digital inclusive finance, such as the use threshold and service costs of credit, payment and monetary fund businesses, and reasonably guide residents to use the new financing for food, durable consumer goods and children's education. At the same time, we will further deepen the reform of digital inclusive finance for cities, regions with high uncertainty, high dependency burden and a high proportion of retired families. Finally, if we want to narrow the consumption gap between different digital inclusive financial development regions, we should mainly start from narrowing the gap in urbanization rate, per capita population size and per capita income in these regions.

Reference

Zhang Tongjin, Cai Kuanning Does digital inclusive finance narrow the consumption gap between urban and rural residents—— Empirical Test Based on China's Provincial Panel Data [J]. Economic Issues, 2021 (09): 31-39. DOI: 10.16011/j.cnki.jjwt.2021.09.004

Wei Junying, Hu Runzhe, Chen Yin'e. How does the development of digital economy affect the urban-rural consumption gap: expanding or narrowing? [J]. Consumer Economy, 2022,38 (03): 40-51

Zhang Haiyang, Han Xiao. Can digital finance ease major social conflicts—— The perspective of consumption inequality [J] Economic Science, 2022 (02): 96-109

Zhu Guolin. Latest Development Trends of Consumption Theory [J]. Economic Trends, 2002 (04): 62-65

Yin Xuequn, Li Xindan, Chen Tingqiang. The impact of farmers' credit on rural economic growth and rural residents' consumption [J] Agricultural Economic Issues, 2011, 32 (05): 21-27

Jappelli T, Pistaferri L. Does consumption inequality track income inequality in Italy? [J]. Review of Economic Dynamics, 2010, 13(1): 133-153.

Gao Fan. Judgment of inflection point of China's urban-rural consumption gap and its growth effect [J]. Statistical Research, 2014,31 (12): 41-46

Yu Jingyuan, Wang Jinxiu. Research on the impact of basic public service expenditure on urban-rural consumption gap [J] Statistics and Decision Making, 2020, 36 (1 1): 114-118

Kong Xiangli, Wang Zhangming. Analysis on Consumption Differences between Urban and Rural Residents in China and Countermeasures [J]. Economic Management, 2013, 35 (05): 1-9

Xu Min, Jiang Yong. Can China's industrial structure upgrade narrow the urban-rural consumption gap? [J] Research on Quantitative Economy, Technical Economy, 2015,32 (03): 3-21. DOI: 10.13653/j.cnki.jqte.2015.03.001

Hu Ridong, Qian Minghui, Zheng Yongbing The impact of China's urban-rural income gap on the consumption structure of urban and rural residents -- an empirical analysis based on the LA/AIDS expansion model [J]. Financial Research, 2014, 40 (05): 75-87

Bian Shu, Zhang Mingzhi. Research on the Impact of Poverty Alleviation Transfer Payment on Urban and Rural Consumption Differences [J]. China Population Science, 2021 (03): 56-68+127

Wu Haijiang, He Lingxiao, Zhang Zhonggen. The impact of China's population age structure on the consumption gap between urban and rural residents [J]. Research on Quantitative Economy and Technology Economy, 2014,31 (02): 3-19+35. DOI: 10.13653/j.cnki.jqte.2014.02.001

Sun Aijun Analysis of the current situation of the consumption gap between urban and rural residents in China and its influencing factors -- an empirical study based on provincial panel data from 1996 to 2009 [J]. Journal of Beijing Industrial and Commercial University (Social Science Edition), 2013,28 (02): 103-111

Cheng Mingwang, Zhang Jiaping. Internet Development and the Consumption Gap between Urban and Rural Residents in the New Era [J]. Research on Quantitative Economy and Technology Economy, 2019, 36 (07): 22-41. DOI: 10.13653/j.cnki.jqte.2019.07.002

He Chunli, Zeng Lingqiu. The Effect of Factor Market Distortion on Reducing the Consumption Gap between Urban and Rural Residents in China [J]. Reform, 2019 (07): 150-159

Zhang Jianping, Ge Yang Transmission mechanism of land financing affecting urban-rural consumption gap -- a study based on the gap between housing prices and urban and rural transport infrastructure [J]. Financial Research, 2021 (08): 31-46+76. DOI: 10.19477/j.cnki.11-1077/f.2021.08.009

Zhou Guangsu, Zhang Xuanyi, Jia Shen, Zhang Chuanchuan. The impact of new rural social endowment insurance on consumption inequality [J]. Economics (Quarterly), 2020, 19 (04): 1467-1490. DOI: 10.13821/j.cnki.ceq., 2020, 03.15

Bai Chong'en, Tang Yanhua, Zhang Qiong. Estimation of China's hidden income scale - interpretation based on the expanded consumption expenditure model and data [J]. Economic Research, 2015, 50 (06): 4-18

Grosh M, Glewwe P. Designing household survey questionnaires for developing countries[M]. Washington, DC: World Bank, 2000.

Zou Hong, Li Aolei, Yu Kaizhi. Measurement of consumption inequality, birth group decomposition and formation mechanism -- and a comparison with income inequality [J]. Economics (Quarterly), 2013,12 (04): 1231-1254. DOI: 10.13821/j.cnki.ceq.2013.04.005

Asad M A, Ahmad M. Growth and consumption inequality in Pakistan[J]. Pakistan Economic and Social Review, 2011: 69-89.

Jappelli T, Pistaferri L. Does consumption inequality track income inequality in Italy? [J]. Review of Economic Dynamics, 2010, 13(1): 133-153.

Kakwani N. The relative deprivation curve and its applications[J]. Journal of Business & Economic Statistics, 1984, 2(4): 384-394.

Blundell R, Etheridge B. Consumption, income and earnings inequality in Britain[J]. Review of Economic Dynamics, 2010, 13(1): 76-102.

Yi Xingjian, Zhou Li. Whether the development of digital inclusive finance has significantly affected household consumption - micro evidence from Chinese households [J]. Financial Research, 2018 (11): 47-67

Zhang Xun, Yang Tong, Wang Chen, Wan Guanghua. Digital Finance Development and Household Consumption Growth: Theory and China Practice [J]. Management World, 2020, 36 (11): 48-63

Li, J., Wu, Y., & Xiao, J. J. (2020). The Impact of Digital Finance on Household Consumption: Evidence from China. Economic Modelling, 86, 317-326.

Wang Xiuhua, Zhao Yaxiong. Is there a Matthew effect in the development of digital

finance—— Experience comparison between poor households and non poor households [J]. Financial Research, 2020 (07): 114-133

Zhou Yuqing, He Guangwen. The impact of the development of digital inclusive finance on the allocation of household financial assets [J]. Contemporary Economic Science, 2020, 42 (03): 92-105

Yang Bo, Wang Xiangnan, Deng Weihua How does digital inclusive finance affect households' access to formal credit—— Evidence from CHFS [J] Contemporary Economic Science, 2020, 42 (06): 74-87

Dohmen T, Falk A, Huffman D, et al. Are risk aversion and impatience related to cognitive ability? [J]. American Economic Review, 2010, 100(3): 1238-60.

Yin Zhichao, Zhang Haodong. Financial knowledge and the wealth gap of Chinese households - evidence from CHFS data [J]. International Financial Research, 2017 (10): 76-86

Dupas P, Robinson J. Why don't the poor save more? Evidence from health savings experiments[J]. American Economic Review, 2013, 103(4): 1138-71.

Lauer K, Lyman T. Digital financial inclusion: Implications for customers, regulators, supervisors, and standard-setting bodies[R]. The World Bank, 2015.

Luan Jiang, Zhang Yuqing, Li Dengwang, Guo Jun A Study on the Income Distribution Effect of Rural Residents of Land Management Right Transfer -- Heterogeneity Estimation Based on Quantile Processing Effect [J] Statistical Research, 2021, 38 (08): 96-110

Rios-Avila, F. (2020). Recentered influence functions (RIFs) in Stata: RIF regression and RIF decomposition. The Stata Journal, 20(1), 51-94.

Fu Qiuzi, Huang Yiping Heterogeneous Impact of Digital Finance on Rural Financial Demand -- Evidence from China Household Financial Survey and Peking University Digital Inclusive Financial Index [J] Financial Research, 2018 (11): 68-84

Guo Feng, Wang Jingyi, Wang Fang, Kong Tao, Zhang Xun, Cheng Zhiyun. Measuring China's digital inclusive financial development: index compilation and spatial characteristics [J]. Economics (Quarterly), 2020,19 (04): 1401-1418

Yin Zhichao, Song Quanyun, Wu Yu. Financial Knowledge, Investment Experience and Family Asset Selection [J]. Economic Research, 2014, 49 (04): 62-75

Zhang Xun, Wan Guanghua, Zhang Jiajia, He Zongyue. Digital Economy, Inclusive Finance and Inclusive Growth [J]. Economic Research, 2019, 54 (08): 71-86

Xu Shu, Wang Diao, Yang Rudai. The income distribution effect of national poverty county policies [J]. Economic Research, 2020, 55 (04): 134-149

Adolfsson, A., Ackerman, M. and Brownstein, N.C. (2019). Clustering or no clustering: clustering method analysis. Pattern recognition, 88, 13-26.

Wu Yu, Li Xiao, Li Jie, Zhou Li Digital financial development and effectiveness of household financial asset portfolio [J] . Management World, 2021,37 (07): 92-104+7

Song Ze, Zou Hong Differentiation in growth: a study on the impact of peer effect on household consumption [J]. Economic Research, 2021,56 (01): 74-89

Fan Gang, Wang Xiaolu Consumption condition model and consumption condition index of each region [J] Economic Research, 2004 (05): 13-21

Fu Qiuzi, Huang Yiping Heterogeneous Impact of Digital Finance on Rural Financial Demand -- Evidence from China Household Financial Survey and Peking University Digital Inclusive Financial Index [J] Financial Research, 2018 (11): 68-84

Guo Changlin Positive fiscal policy, financial market distortion and household consumption [J] World Economy, 2016, 39 (10): 28-52

Guo Feng, Wang Jingyi, Wang Fang, Kong Tao, Zhang Xun, Cheng Zhiyun Measuring China's Digital Inclusive Financial Development: Index Compilation and Spatial Characteristics [J] Economics (Quarterly), 2020, 19 (04): 1401-1418

Huang Qian, Zhu Hongzhi, Su Huiyuan Research on the impact of digital inclusive finance on farmers' entrepreneurial choices [J] Fujian Forum (Humanities and Social Sciences Edition), 2021 (08): 85-102

Qian Haizhang, Tao Yunqing, Cao Songwei, Cao Yuyang Theory and Demonstration of China's Digital Financial Development and Economic Growth [J] Research on Quantitative Economy and Technical Economy, 2020, 37 (06): 26-46

Liu Yurong, Zha Tingjun, Liu Yan, Yang Liu Financial market volatility, economic uncertainty and urban residents' consumption: an empirical study based on SV model [J] Economics (Quarterly), 2019, 18 (02): 551-572

Luan Jiang, Zhang Yuqing, Li Dengwang, Guo Jun A Study on the Income Distribution Effect of Rural Residents of Land Management Right Transfer -- Heterogeneity Estimation Based on Quantile Processing Effect [J] Statistical Research, 2021, 38 (08): 96-110

Ran Guanghe, Tang Tao The Impact of Digital Inclusive Finance on Social Employment -- A Study Based on the Nature of Enterprises and the Heterogeneity of Industries [J] Reform, 2021 (11): 1-14

Wan Jiayu, Zhou Qin, Xiao Yi Digital Finance, Financing Constraints and Enterprise Innovation [J] Economic Review, 2020 (01): 71-83

Wu Fei, Xiang Hailing, Liu Xinyi Digital finance and financial market stability -- from the perspective of stock price collapse risk [J] Economist, 2020 (10): 87-95

Wu Yu, Li Xiao, Li Jie, Zhou Li The Development of Digital Finance and the Effectiveness of Household Financial Portfolio [J] Management World, 2021, 37 (07): 92-104+7

Yang Bo, Wang Xiangnan, Deng Weihua How does digital inclusive finance affect households' access to formal credit—— Evidence from CHFS [J] Contemporary Economic Science, 2020, 42 (06): 74-87

Yi Xing Jian, Zhou Li Whether the development of digital inclusive finance has significantly affected household consumption -- micro evidence from Chinese households [J] Financial Research, 2018 (11): 47-67

Yin Zhichao, Liu Taixing, Zhang Yixing Does digital finance promote residents' employment? [J]. Fujian Forum (Humanities and Social Sciences Edition), 2021 (02): 98-112

Yin Zhichao, Song Quanyun, Wu Yu Financial knowledge, investment experience and family asset selection [J] Economic Research, 2014, 49 (04): 62-75

Zhang Xun, Yang Tong, Wang Chen, Wan Guanghua Digital Finance Development and Resident Consumption Growth: Theory and China Practice [J] Management World, 2020, 36 (11): 48-63

Zhang Xun, Wan Guanghua, Zhang Jiajia, He Zongyue Digital economy, inclusive finance and inclusive growth [J] Economic Research, 2019, 54 (08): 71-86

Zhou Tianyun, Chen Mingxiang Digital penetration, financial inclusion and family wealth growth [J] Financial Research, 2021, 47 (07): 33-47

Zhu Xinkai, Luo Chen The theoretical logic and sinicization of consumption function: a

literature review [J] Economic Research, 2011, 46 (01): 140-153

Agarwal, S., & Chua, Y. H. (2020). FinTech and Household Finance: A Review of The Empirical Literature. *China Finance Review International*.

Ando, A., & Modigliani, F. (1963). The" Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests. *The American economic review*, *53*(1), 55-84.

Berger, A. N. (2003). The Economic Effects of Technological Progress: Evidence from The Banking Industry. *Journal of Money, credit and Banking*, 141-176.

Campbell, J. Y., & Mankiw, N. G. (1991). The Response of Consumption to Income: A Cross-country Investigation. *European economic review*, *35*(4), 723-756.

Cheng, T., & Selden, M. (1994). The Origins and Social Consequences of China's Hukou System. *The China Quarterly*, *139*, 644-668.

Deaton, A., & Grosh, M. (2000). Consumption in Designing Household Survey Questionnaires for Developing Countries. *Designing Household Survey Questionnaires for Developing Countries: Lessons from from*, *15*.

Dogra, K., & Gorbachev, O. (2016). Consumption Volatility, Liquidity Constraints and Household Welfare. *The Economic Journal*, *126*(597), 2012-2037.

Fleisher, B., Li, H., & Zhao, M. Q. (2010). Human Capital, Economic Growth, and Regional Inequality in China. *Journal of development economics*, *92*(2), 215-231.

Hall, R. E. (1978). Stochastic Implications of The Life Cycle-permanent Income Hypothesis: Theory and Evidence. *Journal of political economy*, *86*(6), 971-987.

Havranek, T., Rusnak, M., & Sokolova, A. (2017). Habit Formation in Consumption: A Meta-analysis. *European Economic Review*, *95*, 142-167.

Heckman, J. (1974). Life Cycle Consumption and Labor Supply: An Explanation of The Relationship between Income and Consumption over The Life Cycle. *The American Economic Review*, 188-194.

Jin, Y., Li, H., & Wu, B. (2011). Income Inequality, Consumption, and Social-status Seeking. *Journal of Comparative Economics*, *39*(2), 191-204.

Ji, X., Wang, K., Xu, H., & Li, M. (2021). Has Digital Financial Inclusion Narrowed the Urban-Rural Income Gap: The Role of Entrepreneurship in China. *Sustainability*, *13*(15), 8292.

Koç, T., Turan, A. H., & Okursoy, A. (2016). Acceptance and Usage of A Mobile Information System in Higher Education: An Empirical Study with Structural Equation Modeling. *The International Journal of Management Education*, *14*(3), 286-300.

Lai, J. T., Yan, I. K., Yi, X., & Zhang, H. (2020). Digital Financial Inclusion and Consumption Smoothing in China. *China & World Economy*, *28*(1), 64-93.

Liang, M. (2020). Research on the Impact of Chinese Digital Inclusive Finance on Industrial Structure Upgrade—Based on Spatial Dubin Model. *Open Journal of Statistics*, *10*(05), 863.

Li, J., Wu, Y., & Xiao, J. J. (2020). The Impact of Digital Finance on Household Consumption: Evidence from China. *Economic Modelling*, *86*, 317-326.

Liu, D., Jin, Y., Pray, C., & Liu, S. (2020). The Effects of Digital Inclusive Finance on Household Income and Income Inequality in China?. In Proceedings of the 2020 Annual Meeting, Kansas City, MO, USA, 26–28 July 2020.

Liu, Y., Luan, L., Wu, W., Zhang, Z., & Hsu, Y. (2021). Can Digital Financial Inclusion Promote China's Economic Growth?. *International Review of Financial Analysis*, *78*, 101889.

Meyer, B. D., & Sullivan, J. X. (2013). Consumption and Income Inequality and the Great

Recession. *American Economic Review*, *103*(3), 178-83.

McCallum, B. T., & Goodfriend, M. (1986). Theoretical Analysis of the Demand for Money. *Federal Reserve Bank of Richmond Working Paper*, (86-3).

Modigliani, F., & Cao, S. L. (2004). The Chinese Saving Puzzle and the Life-cycle Hypothesis. *Journal of economic literature*, *42*(1), 145-170.

Nguyen, T. T. (2021). Public Debt, Consumption Growth, and the Slope of the Term Structure. *The Review of Financial Studies*.

Parker, J. A., & Preston, B. (2005). Precautionary Saving and Consumption Fluctuations. *American Economic Review*, *95*(4), 1119-1143.

Schindler, D., & Westcott, M. (2021). Shocking Racial Attitudes: Black GIs in Europe. *The Review of Economic Studies*, *88*(1), 489-520.

Song, Q., Li, J., Wu, Y., & Yin, Z. (2020). Accessibility of Financial Services and Household Consumption in China: Evidence from Micro Data. *The North American Journal of Economics and Finance*, *53*, 101213.

Sun, G., D'Alessandro, S., & Johnson, L. (2014). Traditional Culture, Political Ideologies, Materialism and Luxury Consumption in China. *International journal of consumer studies*, *38*(6), 578-585.

Thakurata, I. (2021). Optimal Portfolio Choice with Stock Market Entry Costs and Human Capital Investments: A Developing Country Model. *International Review of Economics & Finance*, *73*, 175-195.

Wang, X., & He, G. (2020). Digital Financial Inclusion and Farmers' Vulnerability to Poverty: Evidence from Rural China. *Sustainability*, *12*(4), 1668.

Wang, Z., Zhang, D., & Wang, J. (2022). How does digital finance impact the leverage of Chinese households?. Applied Economics Letters, 29(6), 555-558.

Weil, P. (1993). Precautionary Savings and the Permanent Income Hypothesis. *The Review of Economic Studies*, *60*(2), 367-383.

Zhang, Y., Jia, Q., & Chen, C. (2021). Risk Attitude, Financial Literacy and Household Consumption: Evidence from Stock Market Crash in China. *Economic Modelling*, *94*, 995-1006.

Zhao, X., Ma, Y., Li, S., & Si, Z. (2021). The Impact of Inclusive Finance on Household Risk Financial Market Participation. *International Journal of Economics, Finance and Management Sciences*, *9*(4), 165.