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INFLUENCE OF DIGITAL FINANCIAL ADVANCEMENT ON THE CONSUMPTION STRUCTURE OF CHINESE DOMICILES

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Abstract: This study aims to comprehensively investigate the intricate mechanisms through which digital financial development influences residents' consumption structures. Employing regression analyses, mediation effect tests, and heterogeneity analyses across regions, income levels, and human capital groups, the research examines the impact of digital finance on disposable income, consumer credit, and overall consumption patterns. The study innovatively incorporates variables such as entrepreneurial activity, innovation level, and payment environment to provide a holistic understanding of these relationships. The motivation for this research lies in the need to deepen our comprehension of how digital finance shapes consumption behaviors , The findings reveal significant positive associations between digital finance and residents' consumption structures. This research contributes to the existing literature by offering a nuanced perspective on the impact of digital finance on consumption patterns, providing insights relevant for shaping future policies that account for regional and demographic disparities.

Key words: digital finance; resident consumption structure; resident consumption upgrade

1. Introduction

In the era of advancing information technology and artificial intelligence (AI), Alipay, an innovative mobile payment platform launched in 2004 by Ant Financial, a subsidiary of Alibaba, marks over two decades since the advent of digital banking. China's digital finance zenith is posited to have begun in June 2013 with the introduction of the online money market fund, Yu'E Bao, on the Alipay platform (Su et al., 2021). The allure of price advantages in live commerce, online merchandise, and large-scale, low-cost transactions captivates a growing consumer cohort, transforming consumption habits significantly. It is imperative to scrutinize the repercussions of digital financial development on residents' consumption structure.

The surge in digital finance augments residents' income, elevating their consumption echelons. The discourse on the trajectory of China's household consumption is currently fervent (Liu, 2022). The term "consumption" symbolizes consumers allocating an increasing share of fiscal resources to hedonic and developmental pursuits (Turker & Suzer, 2022). Prioritizing survival necessities over opulence suggests a reduction in household expenditures. There is a noticeable uptick in revenue allocated to services, reflecting an overall expenditure surge. Aligned with Maslow's hierarchy of needs theory, the satisfaction of basic needs leads to an

ascent to higher desires. Residents' enhanced consumptive proclivities propel the upward spiral of consumption structure.

This article aims to scrutinize the hypothesis that "Digital finance can propel the evolution of consumption structure." Empirically, we deduce that the impetus from digital finance evolution accentuates residents' indulgence in consumptive pursuits more than rudimentary life requisites, thereby upgrading their consumption structure.

Comprising six delineated sections, the article embarks on a journey. Section 2 unfurls a meticulous review of pertinent literature, delving into the annals of research on digital finance, digital financial services, and the edifice of consumption structure. Section 3 meticulously delineates the fount of data and the variables scrutinized. Section 4 expounds upon the intricacies of model construction. Section 5 unfurls the empirical revelations and subsequent discourse. Section 6 encapsulates the summative conclusions derived from this scopic expedition.

2. Literature review

2.1 Digital Finance

The literature review elucidates the multifaceted nature of digital finance, encompassing technologically advanced mediums like web and mobile platforms. Digital financial services, including e-money, mobile money, card payments, and electronic transfers, empower patrons to engage in financial transactions and cultivate savings through digital avenues (Nasir et al., 2021; Fernandes et al., 2021). The advent of digital financial payment options, such as credit cards and mobile devices, provides convenience, security, and protection, reducing vulnerabilities associated with physical currency (Chen et al., 2021). Digital banking, a conduit for financial modernity, offers small enterprises opportunities for credit history construction and secure financial instruments, contributing to the evolving landscape of fiscal interactions (Ali et al., 2019; Thaddeus et al., 2020).

2.2 Digital financial services

Digital financial services (DFS) emerge as a pivotal force in the forthcoming financial paradigm, driven by advancements in technology (Sharma & Díaz, 2023). DFS, utilizing mobile phones and electronic payment systems, spans credit, payments, savings, insurance, and various other financial services (Anakpo et al., 2023; Babarinde et al., 2020). While DFS broadens avenues for financial access, challenges like security concerns, privacy issues, and reluctance in less developed regions hinder widespread acceptance (Hu et al., 2020; Rana et al., 2020). The intricate terrain of DFS navigation involves addressing issues ranging from technological challenges to a lack of awareness and digital literacy, necessitating a new epoch of financial inclusivity and resilience (Zhang & Navimipour, 2022; Ye et al., 2021).

2.3 Consumption structure

Exploration into consumption structure revolves around calculating consumers' marginal propensity to consume and the price elasticity in various expenditure categories. Models like the extended linear expenditure system (ELES) and the approximate ideal demand system (AIDS) facilitate the computation of elasticity, providing insights into the dynamic interplay between price and income (Lluch, 1973; Deaton, 1980). Venturing beyond traditional economic paradigms, Taylor (2010) combines economic demand theory with Maslow's psychological demand theory to refine the understanding of consumption structure. In the Chinese context, the evolving contours of residents' consumption structure align with a

trajectory characterized by the triad of "survival-development-enjoyment," resonating with Maslow's hierarchy of needs theory (Taylor, 2010).

Building upon the preceding scholarship, the author posits a refined definition of consumption structure: the apportionment of survival consumption, development consumption, and enjoyment consumption within the ambit of household expenditure over a specified temporal span. The ascent of consumption structure, as delineated herein, is construed as the augmentation of the proportion of diverse consumer expenditures within the realms of development and enjoyment consumption within the milieu of household spending. This conceptual refinement lays the groundwork for a nuanced understanding of the intricate tapestry that constitutes the consumption landscape.

3. The Data

3.1 Data source and variable description

This section presents meticulously curated provincial panel data from 2012 to 2022, encompassing 31 provinces in China. Data sources include the "China Statistical Yearbook," provincial statistical yearbooks, the China Internet Network Information Center's (CNNIC) report on China's Internet development, and the People's Bank of China's quarterly payment business report. Insights from the university's digital finance research center, found in the China Regional Financial Transaction Report and the Peking University Digital Financial Inclusion Index Report, further enrich the data.

At the core is residents' consumption structure, linked with per capita consumption habits. Using eight consumer expenditure categories from the China Statistical Yearbook, evolving contours are discerned.

Control variables, grounded in academic and theoretical elucidations, encompass factors influencing residents' consumption propensity. Instrumental variables include metrics like website numbers, CN domain names, and the Internet penetration rate. An historical artifact, derived from multiplying the 1983 Internet penetration rate with provincial postal and telecommunications data, serves as the second instrumental variable.

Intermediate variables reflect regional entrepreneurial dynamism and innovation levels, influencing the supply side. Determinants include bank card spending rates, maximum income per capita, credit balances per capita, and income shortfalls per capita.

Aligned with Engel's law, this chapter uses the proportion of development and enjoyment consumption expenditures in total consumption expenditures as a proxy variable for consumption structure in robustness testing, concluding this intellectual journey.

3.2 Statistical description

The statistical description of the explained variables in this chapter is shown in Table 1 below.

variable name	sample size	average	standard deviation	minimum value	maximum value
Survival consumption	341	0.414	0.040	0.251	0.502
Development consumption	341	0.088	0.010	0.049	0.107

Enjoyment consumption	341	0.681	0.051	0.501	0.804

The analysis of regression results involves descriptive statistics for three variables: survival consumption, development consumption, and enjoyment consumption, based on a sample size of 341. Survival consumption, with an average of 0.414, represents 41.4% of total consumption, showing moderate variability. Development consumption averages 0.088 (8.8%), indicating less variability, while enjoyment consumption averages 0.681 (68.1%), with moderate variability. The interpretation suggests the priority of survival consumption aligns with economic theory, reflecting individual preferences and constraints. Heterogeneity arises from factors like income, age, family size, and personal preferences.

In light of the aforementioned descriptive statistical revelations, a salient inference materializes: the consumption structure of Chinese denizens exhibits a conspicuous trajectory. The proportion dedicated to alimentary expenses exhibits a discernible descent, concomitant with an incremental ascent in the allocation for development and enjoyment consumption expenditures.

4. Methodology

We use a short panel fixed effects model to analyze the impact of digital financial development on residents' consumption structure.

The regression model is as follows:

$$ConsC_{it} = \beta_o + \beta_1 D F_{it} + \beta_2 X_{it} + \varphi_i + \varphi_t + \xi_{it} \quad (1)$$

$$ConsC_{it} = \beta_o + \beta_1 D F_{it-1} + \beta'_2 X_{it} + \varphi_i + \varphi_t + \xi_{it} \quad (2)$$

Within this contextual framework, the subscripts i and t denote the province and time, respectively. The focal point, Cons, encapsulates the elucidated variable pertaining to residents' consumption structure. Meanwhile, the pivotal explanatory variable is represented by DF_{it}, signifying the core underpinning of digital financial development. The variable X_{it} incorporates other controlling factors capable of influencing residents' consumption structure. The nuanced interplay of province and year is encapsulated in the fixed effects φ_i and φ_t, respectively, while ξ_{it} represents the stochastic component, introducing a level of random perturbation.

In Model 2, a temporal lag of one period is introduced to the digital financial development variable in the robustness test. This strategic adjustment serves the purpose of mitigating potential endogeneity challenges stemming from reverse causality.

5. Empirical results

5.1 Baseline regression

Model (1) intricately computes residents' consumption structure as the dependent variable, unraveling the nuanced impact of digital financial development. The elegant results of this regression analysis are presented in Table 2's tabular expanse.

Table 2 baseline regression

Dependent variable consumption structure	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
digital finance	0.031**	0.026**	0.018**	0.013***	0.010**	0.012***
	(2.145)	(2.298)	(2.405)	(3.408)	(2.382)	(3.303)

GDP per capita		0.094**	0.217***	0.114***	0.103**	0.101**
		(2.358)	(4.528)	(3.048)	(2.330)	(2.527)
financial development		0.034*	0.125***	0.058**	0.052	0.032
		(1.977)	(4.523)	(2.255)	(1.512)	(1.141)
urbanization			0.259***	0.382***	0.373***	0.410***
			(4.226)	(10.415)	(10.570)	(9.008)
human capital			0.008	0.021	0.015	-0.003
			(0.446)	(1.212)	(0.781)	(-0.180)
Education expenditure				-0.034**	-0.021	-0.049***
				(-2.233)	(-1.348)	(-3.676)
medical expenditures				0.058**	0.062**	0.043**
				(2.625)	(2.741)	(2.636)
social security expenditures				-0.016	-0.012	-0.032*
				(-0.901)	(-0.604)	(-1.893)
old age dependency ratio					0.018	-0.033*
					(0.796)	(-1.724)
child dependency ratio					-0.079**	-0.088**
					(-2.292)	(-2.522)
per capita disposable income						0.083***
						(6.699)
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Obs.	341	341	341	341	341	341
R^2	0.040	0.046	0.205	0.389	0.412	0.519

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

As per regression analysis, a discernible correlation indicates the positive connection between digital financial development and residents' consumption diversification. Specifically, after adjusting for correlated variables, a one standard deviation increase in digital financial development corresponds to a 0.012 standard deviations rise in consumption structure. In practical terms, a 10% increase in digital financial development results in a 1.2% rise in

consumption structure. This underscores the pivotal role of digital finance in shaping residents' consumption behavior .

5.2 Sub- indicator regression□□

The regression outcomes, delineating the ramifications of the secondary and tertiary indicators of digital financial development on the intricate framework of residents' consumption structure, are eloquently presented in Table 3.

Table 3 sub-indicator regression

Dependent variable consumption structure	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
breadth of coverage	0.008***					
	(2.904)					
Use depth		0.015***				
		(4.040)				
degree of digitalization			0.003*			
			(1.850)			
payment index				0.009*		
				(1.712)		
insurance index					0.003*	
					(1.722)	
credit index						0.015***
breadth of coverage						(3.699)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Obs.	341	341	341	341	341	341
R^2	0.515	0.526	0.506	0.509	0.507	0.526

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

Regression analysis reveals significant impacts of both secondary and tertiary indices of digital financial development on residents' consumption structure. Controlling for variables, a one standard deviation increase in the digital financial development index corresponds to a 0.008 standard deviations rise in consumption structure. In practical terms, a 10% increase in coverage breadth equates to a 0.8% rise in consumption structure.

Contrastingly, the depth of usage indicator, reflecting engagement with digital financial services, notably influences consumption structure. A 10% surge in usage depth results in a 1.5% augmentation. The digitalization degree indicator has a more muted effect, with a 0.003 standard deviations increase for every one standard deviation rise, corresponding to a modest 0.3% enhancement in consumption structure.

In the tertiary tier, the payment index, mirroring residents' inclination towards digital payment tools, is a salient determinant. A 10% amplification results in a palpable 0.9% rise. The insurance index has a relatively feeble influence, with a 0.003 standard deviations increase corresponding to a modest 0.3% uplift. The credit index, reflecting residents' engagement with digital credit services, is the most impactful, with a 10% upswing resulting in a substantial 1.5% surge in consumption structure.

5.3 Robustness check

To further enhance the robustness of our analysis, we introduce a temporal lag to the core explanatory variables, lagging the level of digital finance development by a single period. This strategic use of the lagged variable method helps mitigate endogeneity concerns by temporally staggering the core explanatory variables. □

Table 4 Robustness test results 1

dependent variable consumption structure	Model 1 Fixed effects+IV	Model 2 Fixed effects+IV+GMM	Model 3 Fixed effects + IV1 (post office)	Model 4 Fixed effects + IV2 (telephone)
digital finance	0.003*** (3.326)	0.001** (2.092)	0.583** (2.203)	0.115*** (4.450)
control variables	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes
Unrecognizable test	0.000	0.000	0.006	0.058
Weak instrumental variables test	23.936	23.936	10.681	13.797
overidentification test	0.410	0.410		
Obs.	341	341	341	341
R^2	0.290	0.288	0.256	0.283

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

The fixed effects regression, incorporating Instrumental Variables (IVs) and the Generalized Method of Moments (GMM), reveals a consistently positive and significant impact of digital finance on consumption structure. With a coefficient of 0.583, an increase in digital finance correlates with a more diversified and efficient consumption structure. This result holds across diverse fixed effects regressions, with digital finance coefficients ranging from 0.001 to 0.115, and significance levels between 1% and 5%. These robust findings underscore the crucial role of digital finance in promoting economic development by enhancing consumption structure. Control variables, with coefficients between -0.255 and 0.120, emphasize the intricate nature of factors influencing consumption, where digital finance is just one contributing element. Additionally, the significance of province and year fixed effects

across models indicates regional and temporal variations in the impact of digital finance on consumption structure.

5.4 Mediation effect test

5.4.1 Test 1

This study employs residents' per capita disposable income and per capita consumer credit data as gauges for residents' income levels and the liquidity constraints confronting them to empirical testing to ascertain their role as intermediary factors. The ensuing empirical results are meticulously delineated in Table 5. □

Table 5 Mechanism Test 1

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	consumption structure	disposable income	consumption structure	consumption structure	consumer credit	consumption structure
digital finance	0.010**	0.032***	0.012***	0.012***	0.005**	0.009***
	(2.382)	(25.002)	(3.303)	(3.303)	(2.047)	(3.303)
disposable income			0.053***			
			(6.699)			
consumer credit						0.128***
						(7.415)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Obs.	341	341	341	341	341	341
R^2	0.412	0.822	0.403	0.519	0.474	0.520

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

It's evident that digital finance profoundly impacts consumption structure, alleviating liquidity constraints. Both Model 1 and Model 2 demonstrate a significant positive link between digital finance and consumption structure, emphasizing its pivotal role.

In Models 3 and 4, a noteworthy positive correlation between digital finance and disposable income is observed, revealing its nuanced role in enhancing residents' economic well-being. Lastly, Models 5 and 6 show a significant positive association between digital finance and consumer credit, highlighting its pivotal role in fostering consumer financial empowerment.

These empirical revelations provide tangible proof of digital finance's impact on consumption structure and enhance our understanding of its multifaceted role in shaping residents' consumption dynamics.

5.4.2 Test 2

The maturity of digital finance has reduced income uncertainty, increased residents' consumption propensity, optimized the payment pattern, reduced financial burdens, and significantly improved the consumption structure. The results of the correlation regression analysis are shown in Table 6.

Table 6 Mechanism Test 2

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	consumption structure	Premium income	consumption structure	consumption structure	payment environment	consumption structure
digital finance	0.012***	0.558***	0.001**	0.012***	0.136***	0.002**
	(3.303)	(38.591)	(2.454)	(3.303)	(9.350)	(1.993)
Premium income			0.001*			
			(1.813)			
payment environment						0.003***
						(4.833)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Obs.	341	341	341	341	341	341
R^2	0.519	0.763	0.530	0.519	0.363	0.582

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

Table 7 reveals regression outcomes from six models utilizing variables like consumption structure, premium income, payment environment, and digital finance to predict personal financial service utilization。

In Model 2, premium income shows a noteworthy positive correlation, but in Model 3, its significance diminishes, potentially due to the inclusion of year fixed effects in Model 2. Conversely, digital finance consistently exhibits a significant positive correlation in both Model 4 and Model 6, indicating its favorable influence on personal financial service utilization.

These findings underscore the pivotal roles of consumption structure, payment environment, and digital finance as determinants influencing personal financial service utilization.

5.4.3 Test 3

Entrepreneurship has become a driving force for technological innovation, promoted market competition, and played a vital role in shaping the development of digital finance. In order to remain invincible in the fierce market competition, entrepreneurs must continue to innovate, launch new products and services, and improve product quality at the same time. This innovative culture not only meets the diverse needs of residents, but also activates consumption patterns.

Table 8 details the empirical evidence supporting this complex interaction.

Table 7 Mechanism Test 3

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	consumption structure	Entrepreneurial activity	consumption structure	consumption structure	Innovation level	consumption structure
digital finance	0.012***	0.131*	0.011***	0.012***	0.136***	0.010***
	(3.303)	(1.882)	(3.046)	(3.303)	(3.356)	(3.303)
Entrepreneurial activity			0.051			
			(0.428)			
Innovation level						0.008*
						(1.812)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Obs.	341	341	341	341	341	341
R^2	0.519	0.316	0.572	0.519	0.191	0.613

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

Regression analyses confirm the significant and positive influence of digital finance on consumption structure in various models. Models 1 and 2 reveal its direct and statistically significant impact, highlighting its catalytic role in consumption elevation. Models 3 and 4, incorporating entrepreneurial activity and innovation level, emphasize their substantive and positive influence on consumption structure, showcasing the constructive roles of entrepreneurship and innovation. Conversely, Models 5 and 6 introduce the payment environment as an intermediary variable, underscoring the robust impact of digital finance on consumption structure. This emphasizes the pivotal role of the payment environment in mediating the relationship, showcasing how improvements enhance consumption ease and ubiquity. These sequential model outcomes collectively highlight the direct impact of digital finance and the crucial intermediary roles of entrepreneurial activity, innovation level, payment environment, and other contributing factors.

5.5 Heterogeneity analysis

5.5.1 Heterogeneity Analysis 1

In order to examine the regional differences in the impact of digital financial development on residents' consumption structure, this study divided the sample into three regions: eastern, central and western regions, corresponding to the main economic zones. Regression analysis shown in the Table 8.

Table 8 Heterogeneity analysis 1

dependent variable	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
consumption structure	fixed effects			Fixed effects+IV+GMM			Fixed effects+IV2		
	east	central	west	east	central	west	east	central	west
digital finance	0.030**	0.011***	0.006**	0.073**	0.071*	0.036***	0.443**	0.302**	0.254*
	(2.659)	(4.335)	(2.323)	(2.046)	(1.707)	(3.222)	(2.506)	(2.292)	(1.746)
control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Unrecognizable test				0.056	0.026	0.001	0.014	0.047	0.000
Weak instrumental variables test				10.926	11.009	10.603	10.228	14.131	12.375
overidentification test				0.496	0.163	0.864			
Obs.	121	88	132	121	88	132	121	88	132
R^2	0.244	0.359	0.173	0.194	0.387	0.234	0.472	0.362	0.270

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

In Model 1, digital finance significantly and positively impacts consumption structure across China's regions. The coefficients in the eastern, central, and western regions are 0.030, 0.011, and 0.006, respectively, indicating digital finance as a crucial driver of consumption growth.

In Model 2, after controlling for factors like income, education, and age, the positive and significant impact of digital finance on consumption structure persists in all three regions.

Model 3 reveals a notably larger digital finance coefficient than Model 1, indicating a nuanced relationship. Weak instrumental variables and overidentification tests support the causal interpretation.

The impact is most significant in the economically developed eastern region, followed by the central region, and relatively smaller in the western region. Economic development, income levels, financial infrastructure, and consumption tendencies contribute to regional variations. Digital finance's role in the western region is notably weakened due to lower economic development, income levels, infrastructure, and conservative consumption habits.

5.5.2 Heterogeneity Analysis 2

To delve deeper into potential disparities in the impact of digital financial development on the enhancement of residents' consumption structures based on income levels, this study

stratifies the complete sample into high-income and low-income cohorts, determined by regional per capita disposable income. Subsequent sub-sample regressions were conducted, and the outcomes are presented in Table 9.

Table 9 Heterogeneity analysis 2

dependent variable consumption structure	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	fixed effects		Fixed effects+IV+GMM		Fixed effects+IV2	
	low income	High income	low income	High income	low income	High income
digital finance	0.009***	0.028**	0.007***	0.012***	0.255***	0.458***
	(3.477)	(2.290)	(2.635)	(5.531)	(3.159)	(3.999)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Unrecognizable test			0.001	0.013	0.071	0.036
Weak instrumental variables test			10.190	15.832	20.025	20.881
overidentification test			0.315	0.897		
Obs.	225	116	225	116	225	116
R^2	0.105	0.205	0.451	0.468	0.550	0.489

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

In Model 1, the digital finance coefficient is 0.009 for low-income groups and 0.028 for high-income groups, indicating a significant positive impact on both groups' consumption structure.

Model 2, after controlling for factors like income, education, and age, maintains a positive and significant digital finance coefficient in both income groups.

Model 3 reveals a notably larger digital finance coefficient than Model 1, indicating a nuanced relationship between digital finance and consumption structure.

For low-income groups, digital finance's cost reductions enhance consumption potential, overcoming financial constraints. High-income groups prioritize consumption quality and experience, and digital finance provides choices and rich experiences, promoting an improved consumption structure.

5.5.3 Heterogeneity Analysis III□□

To explore the potential influence of human capital on the impact of digital financial development on residents' consumption structures, this study stratifies samples into high- and low-education-level groups based on regional education levels. Subsequently, sub-sample regressions are conducted, and the outcomes are presented in Table 10.

Table 10 Heterogeneity analysis 3

	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
dependent variable	fixed effects		Fixed effects+IV+GMM		Fixed effects+IV2	
consumption structure	low human capital	High human capital	low human capital	High human capital	low human capital	High human capital
digital finance	0.004**	0.016**	0.029***	0.106***	0.141**	0.124**
	(1.780)	(1.758)	(2.623)	(2.593)	(2.104)	(2.499)
control variables	yes	yes	yes	yes	yes	yes
Province fixed effects	yes	yes	yes	yes	yes	yes
year fixed effects	yes	yes	yes	yes	yes	yes
Unrecognizable test			0.000	0.043	0.022	0.046
Weak instrumental variables test			19.518	13.262	21.405	20.348
overidentification test			0.638	0.613		
Obs.	176	165	176	165	176	165
R^2	0.212	0.217	0.424	0.455	0.327	0.765

Note: "***", "**", and "*" indicate significant at the 1%, 5%, and 10% levels respectively, and the t statistics are in parentheses.

In Model 1, digital finance significantly impacts the consumption structure of two human capital groups, indicating its potential to foster consumption growth across varied human capital levels. Model 2, incorporating control variables like income and education, sustains a strong positive effect, highlighting digital finance's independent impact. Model 3 establishes a causal link, with a larger coefficient compared to Model 1, emphasizing a more nuanced relationship.

Digital finance reduces diversified consumption costs, promoting consumption upgrade for groups with limited human capital. Conversely, higher human capital groups prioritize consumption levels and experiential aspects, showcasing varied preferences influenced by the emergence of digital finance.

6. Conclusion and Discussion

Through regression analysis and mediation effect testing, our research found that the maturity of digital finance has expanded residents' consumption structure. Heterogeneity analysis reveals how the impact of digital finance varies across regions, income levels and human capital classes. The eastern region, characterized by lower income and human capital, has a higher propensity to benefit from the impact of digital finance on consumption structure. In contrast, the impact in central regions and groups with higher income and human capital is relatively limited.

Policymakers should consider regional differences in digital financial development, formulate strategies to meet different regional needs, and optimize infrastructure construction for digital financial development. In addition, to give full play to the role of technological innovation in promoting financial service and product innovation, it is necessary to adopt targeted intervention measures based on the unique characteristics of different social classes to better meet their personalized financial services.

Although this study provides valuable insights, it also faces limitations. First, limitations of the data set may prevent a comprehensive examination of all relevant factors. Furthermore, methodological limitations may limit the establishment of certain causal relationships. Future research efforts should explore alternative approaches to overcome these limitations and enhance the robustness of the study.

In order to enhance the understanding of this field, future research needs to strengthen the study of regional differences, in-depth study of the response of different regions, or urban and rural differences to the development of digital finance, and in-depth understanding of local economic differences. These research directions aim to bridge the gap and contribute to a more comprehensive understanding of the impact of digital finance on all levels of household consumption.

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