How Does FinTech Affect Consumer Non-cash Payment Satisfaction? The Moderating Role of Financial Knowledge

Fuzhong Chen[1*] and Xiaoyan Chen[1]

[1]*School of International Trade and Economics, University of International Business and Economics, Beijing, China.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

As the merger of innovations from developing financial services for the twenty-first century, FinTech has brought payment methods into a new and electronic era, and non-cash payment is gradually becoming the mainstream for transaction activities. This study empirically investigates the effects of FinTech on consumer non-cash payment satisfaction, and the moderating role of financial knowledge is examined as well. Utilizing the data from the China Household Finance Survey in 2017, the results indicate that the use of FinTech can significantly promote consumer satisfaction towards non-cash payment. The mechanism analysis specific to the moderating role also shows that financial knowledge positively contributes to the impacts of FinTech on consumer non-cash payment satisfaction. The findings of this study imply that financial service providers are recommended to promote their facilities to meet consumers' increasing demand for financial services. Besides, consumers should also take the initiative to improve their financial knowledge to better integrate non-cash payment into life and enjoy the satisfaction brought by FinTech.

_____

*Corresponding author: Email: uibesitechen@126.com;

1. INTRODUCTION

With the advent of the fourth industrial revolution, FinTech has exploded onto the scene as a result of the marriage of cutting-edge technology with financial innovation. FinTech is a financial technology innovation that introduces new products, applications, and business models with the potential to impact the provision of financial services and the financial industry's growth, as well as to foster a competitive and reputational market culture among service providers [1,2]. The development of FinTech has a profound impact on many traditional financial services such as payment, investment, and financing, personal wealth management, deposits, and loans. It makes the payment system gradually expand from the primitive exchange of goods to cash payment, national credit, and bill settlement [3]. Especially in recent years, the technological innovation of computer technology and the Internet has brought the payment method into a new electronic and network era, and non-cash payment is gradually becoming the mainstream for transaction activities.

Non-cash payment is a brand-new payment method born under Internet technology, which is directly linked to financial institutions and FinTech payment services [4], transferring funds between the payer and the payee via a mobile device and the Internet [5]. In the process of economic and social exchange of commodities, the application of non-cash payment settlement methods provides great convenience for the practice of currency payment methods, especially when consumers are buying relatively high-value products including gold and silver jewelry, real estate, and automobiles. Besides, non-cash payment and settlement tools can well avoid unnecessary economic losses caused by counterfeit currency, and reduce the costs of custody and escort of cash. Benefiting from the aforementioned advantages of higher capital flow efficiency and lower transaction costs, non-cash payment can provide consumers with a more efficient, convenient, and flexible shopping experience. As direct contact and cash are no longer necessary to conduct transactions and exchange value, it has reshaped the way consumers and merchants trade and gradually become the mainstream of daily life.

The growth of FinTech is expected to accelerate the adoption of non-cash payment. Since 2013, the total number of non-cash payments made by retail payment instruments in China has been ranked second in the world. When it comes to the total value of non-cash payments, China has long been an absolute leader in the world, with the United States, Britain, and Germany ranking second, third, and fourth, respectively [6]. In 2020, the outbreak of the COVID has accelerated the penetration of digital payments. According to a McKinsey report, in 2021, China's cash transaction volume will only account for 41%, compared with 99% in 2010. In major mature markets, this proportion will be less than 54% in 2021.

With the promotion of FinTech, China's non-cash payment market is booming, service innovation and scene applications are becoming more abundant, which has a substantial impact worldwide. The convenience and efficiency of online payment have greatly improved people's payment satisfaction. Although FinTech has traditionally been found to be positively associated with consumer satisfaction [7-9], the recent FinTech crisis has provided some reasons to question whether prior research is still applicable. Nowadays, the cross integration of FinTech has significantly increased the uncertainty of risk. Based on existing market advantages and technological means, some payment institutions have seized data entry channels, gathered a large amount of information and capital flows, and formed data oligarchs and supervision. Inaccessible data islands, the risk of centralized information leakage increases [10,11]. Some institutions even use consumers' information as a bargaining chip and tool for business profit. Data resources are freely exported or abused for commercial activities [12]. This poses a threat to consumer privacy rights and even financial security. Also, it is pivotal that new technologies may lead to excessive consumption, excessive borrowing, and excessive investment, which will negatively contribute to household financial wellbeing, especially for those who are with low levels of financial knowledge [6]. Thus, how the development of FinTech will affect consumer satisfaction with non-cash payment is vital to be further investigated in detail.

In the recent decade, there is a rising amount of previous studies on Fintech and consumer satisfaction, but little literature has covered the

impacts of FinTech on consumer non-cash payment satisfaction. First, the extant literature on FinTech's impact on consumer financial satisfaction is primarily theoretical and from a macro perspective. Few studies have undertaken empirical testing on the real scenario in China, and therefore the actual benefit of FinTech in boosting the consumer experience has yet to be validated by more empirical investigations. Second, the measurements of FinTech in prior studies are too broad to accurately capture its impacts on consumer financial satisfaction specific to non-cash payment. Extant measurements reflect consumers' interest in FinTech but do not represent the development status of FinTech in the real industry and enterprises [13]. Thirdly, most extant studies have focused on the relationship between FinTech and consumer overall financial satisfaction, but little researches focused on the specific field of consumer satisfaction, such as payment satisfaction [7,9,14,15]. Payment satisfaction is crucial for consumer financial satisfaction, which is linked to their perception of the total shopping experience [16,17]. Unlike previous research, this study aims to investigate the impacts of FinTech on consumer non-payment satisfaction, which is informative for policymakers and financial institutions to formulate effective measures to promote consumer financial wellbeing. Last but not least, previous studies have proved that the development of FinTech is positive to the improvement of non-cash payment satisfaction [6,18,19], but the influence channels have yet to be uncovered. The basic comprehension of financial principles is defined as financial knowledge, and such knowledge allows consumers to better use FinTech and manage financial affairs effectively [20]. Thus, it is pivotal to investigate the influence mechanism of financial knowledge between FinTech and non-cash payment satisfaction.

Utilizing data from the China Household Finance Survey (CHFS), the purpose of this study is to examine the role of Fintech in affecting consumer non-cash payment satisfaction. Furthermore, this study explores the influence mechanism of FinTech's impact on consumer non-cash payment satisfaction from a new perspective of financial knowledge, and the moderating role of financial knowledge has been examined as well. The remainder of this study is structured as follows. Section 2 highlights the findings of FinTech, consumer non-cash payment satisfaction, and financial knowledge, and then puts forward hypotheses specific to the impacts of FinTech on consumer non-cash payment satisfaction. Section 3 describes the sample data, econometric specification, and variable measurements. Section 4 discusses the empirical results. Section 5 concludes and offers implications.

2. LITERATURE REVIEW AND HYPOTHESES

2.1 Previous Research on FinTech

FinTech refers to financial technology services that combine finance and technology to make financial services more efficient and readily available [7]. Both traditional and emerging FinTech services fall under the umbrella term FinTech services. Financial institutions (i.e., banks) provide traditional financial services, such as online banking and mobile trading, through IT-enabled services like mobile banking. Simultaneously, mobile payment services (i.e., Alipay, WeChat Payment, etc.), crowd fund-raising, cryptocurrency, and other new financial services provided by non-financial organizations are considered to be emerging FinTech services [7].

As a result of the Fourth Industrial Revolution, the financial system has undergone drastic changes, which has increased consumers' interest in FinTech. FinTech can be found in a wide range of sectors, such as banking, trust, insurance, securities, and e-commerce payments, as it spans from the application of artificial intelligence and machine learning to big data and from biometric identification to blockchain technology [21]. The rise of FinTech has revolutionized the development pattern of the traditional financial sectors, prompting them to form a new ecological map of the science and technology industry, which provides a new idea for finance to better serve the development of a real economy.

Regarding specifically the economic utility of FinTech, previous studies suggest that the rise of FinTech has made financial services more geographically penetrating [22] and improved the situation of small coverage and high service cost of financial services in less developed areas, especially in rural areas [23]. Secondly, the effects of resource allocation caused by FinTech innovation are critical in addressing information asymmetry as well as rising household income

[24]. Thirdly, the development of FinTech has stimulated the derivation of a large number of new types of financial needs. With the rise of e-commerce platforms, increasingly more forms of shopping services have been developed, which has promoted the change in the consumption market [6]. Hence, the development of FinTech will undoubtedly affect consumers' wellbeing from various aspects, and the improvement of consumers' quality of life will definitely affect their financial satisfaction.

2.2 Previous Research on Financial Satisfaction

The quality of a consumer's life is determined by her or his perception of wellbeing, which may be defined as the level of contentment, satisfaction, or pleasure in life as compared to the goals and objectives [25]. Financial satisfaction is based on consumers' assessment of their current financial situation [26] and is a subcomponent of overall wellbeing [27]. Composed of numerous aspects including objective factors, such as income or assets, and subjective factors, such as financial attitude, financial satisfaction is a critical notion for social development.

As a complex concept, a large and growing body of literature has investigated the determinants of financial satisfaction. To better understand how consumers' financial wellbeing is affected, Joo and Grable [28] argued that financial behavior is considered to be the most important determinant of financial satisfaction, followed by financial stress and self-assessed financial knowledge. They also suggested that consumers who engage in more logical financial behaviors are less stressed by money, while those with better financial knowledge are more satisfied with their finances. Vlaev and Elliot [29] revealed that having overall financial control is a crucial element in consumer financial satisfaction, including being knowledgeable of the financial condition, controlling monthly expenses, and familiarity with financial affairs. Besides, according to a study carried out in Albania's transitional economy, the worker's satisfaction in the informal sector is lower than that of their formal-sector colleagues [27]. A better understanding of financial contentment and its determinants, as well as an increase in domain-related knowledge, aid policymakers in improving consumer financial wellbeing. Several studies have shown that financial wellbeing is affected by how satisfied consumers are with their payments, and non-cash payment satisfaction. However,

only a few research attempts to focus on the specific components of satisfaction, especially the non-cash payment satisfaction that regularly arises in consumers' consumption and lives. To help fill the gap in consumer financial satisfaction, this study aims to investigate the associations between FinTech and consumer non-cash payment satisfaction.

2.3 The Association between FinTech and Consumer Non-cash Payment Satisfaction

Previous studies have provided evidence that FinTech will affect consumer financial satisfaction by changing their consumption patterns. Campbell and Mankiw [30] suggested that financial constraints will lead to consumers' consumption demand being depressed, and developing financial markets can help consumers with liquidity constraints to achieve cross-period consumption, thus better-releasing consumption demand. Besides, with the integration of "finance" and "technology", financial services such as mobile payment and online lending have effectively expanded the boundary of traditional finance and played a vital role in easing financial exclusion [22]. Meanwhile, FinTech contributes to improving the impact on consumer wellbeing by raising the consumption level. The prior research has not reached a consistent conclusion, and several studies indicate that the increase in consumption means the increase in utility from a material perspective. Mettler [31] argued that mobile technology and other digital services, such as electronic payment/money transfer, smart cards, electronic money, and institutional partnerships, have the potential to expedite the arrival of low-cost, and broadly accessible sources of financing, as well as improve consumer financial satisfaction. In terms of the Global Financial Inclusion Index, increasingly more consumers are more likely to use non-cash payment, which largely depends on the innovation of payment ways brought by FinTech. Besides, Bayero [32] documented the Nigerian cashless policy and concluded that the lack of cash payment awareness and financial infrastructure has played a significantly negative role in household satisfaction. Bourreau and Valletti [33] suggested that the improvement of cashless payment applications is affected by the competition among mobile service providers. Innovations in FinTech, especially in the areas of savings and payments, can significantly decrease transaction costs and improve

consumers' quality of life. In terms of the aforementioned discussions, the mechanisms that FinTech may improve consumer non-cash payment satisfaction are primarily reflected in three ways.

The first is the transaction promotion effect. The development of FinTech has reduced the cost of currency use. Cash uses physical objects as the carrier, and the entire issuance and circulation process requires certain production resources, logits resources, service resources, and processing resources. Moreover, financial institutions and consumers need to jointly bear a certain cash usage cost, which increases with the scale of the transaction volume. FinTech has promoted the digitalization of currency, which has greatly reduced the cost of using currency. The larger the currency in circulation, the more obvious the scale effect of cost savings. Meanwhile, the development of financial technology has reduced transaction risks. Through the innovation of payment technology and the improvement of related infrastructure, the use of non-cash payment has been substantially increased. Reduced transaction costs can expand the scope of transactions, and improved transaction convenience can speed up transactions, which makes payments more efficient. For individual consumers, the increase in transaction activities and the reduction in single transaction costs will have a multiplier effect on the overall transaction cost savings, thereby increasing their satisfaction with non-cash payments.

The second is the wealth creation effect. While the development of FinTech makes fund account transactions more convenient, it also provides an investment facilitation mechanism to help consumers access more financial products. For instance, investors can obtain a large amount of financial product information on the mobile payment platform, find financial products that meet their needs more conveniently, decrease the cost of information search for investors, and increase the coverage of inclusive finance. Simultaneously, the mobile account is bound to the setting of consumer payment, which makes it possible to facilitate the investment. For example, consumers can invest their change in various short-term financial products to increase their return.

The third is the credit superimposition effect. FinTech provides a credit superimposition mechanism, which broadens the sources of funds for consumers to use for consumption and investment. In terms of consumer payment data, Alipay launched Huabe to provide consumers with credit loans, similar to JD Baitiao. Meanwhile, financial institutions can also provide large-amount of lending services based on personal credit and consumption expenditures. This part of the credit funds can help alleviate consumer financial pressure, and even part of the funds can be used for investment, thereby further increasing the financial satisfaction they obtain from non-cash payment.

In terms of the aforementioned discussions specific to influence channels, this study puts forward the following hypothesis:

H1: FinTech is positively associated with consumer non-cash payment satisfaction, that is, consumers who use FinTech more in payment can get higher financial satisfaction from non-cash payment.

2.4 The Moderating Role of Financial Knowledge

Financial knowledge is utilized to reflect consumers' mastery and sensitivity of economic and financial information. Having more financial knowledge often makes consumers more rational in the process of consumption. The integration with financial digital technology makes enough financial knowledge necessary for consumers to obtain inclusive finance effectively. FinTech can make consumers more convenient to access financial information and financial products, and enable them to increase financial practice through participation in the financial market, which is positive to enhance financial satisfaction. On the contrary, the lack of financial knowledge will limit consumers' further use of various financial products and services when the physical equipment of the financial sectors is constantly replaced by intelligent digital equipment, which will decrease consumers' participation in the financial market.

FinTech can be used to improve desired financial competence, according to McKillop, French, and Stewart [33]. Based on a randomized control study, the results show that participating consumers who utilized the programs showed significant gains in financial knowledge, awareness, and basic abilities, as well as attitudes and motives. When faced with a financial shock, those consumers who utilized the apps are more likely to maintain track of their

income and expenses. Existing research generally implies that financial knowledge and financial satisfaction are linked favorably. In the 50+ age group, Murphy [34] investigated the associations between financial knowledge and several psychological characteristics of financial satisfaction, hopelessness, and religion, and the results suggest a weak positive relationship between financial knowledge and financial satisfaction. Utilizing data from Greek college students, Philippas and Avdoulas [35] examined the relationship between financial knowledge and financial wellbeing, and the results show that students who are more financially aware are better to deal with financial shocks. Akin et al. [36] suggested that those with higher financial knowledge and who put it to good use when dealing with money have fewer money troubles. Furthermore, Engels, Kamlesh, and Philip [37] investigated financial fraud, which is anticipated to result in significant losses in terms of consumer morale and trust in financial institutions. The results indicate that fraud strategies are becoming more complicated, and that the degree of complexity required to identify fraud is provided by more financial understanding rather than fundamental money management abilities.

The discussion above shows that most of the literature focuses on the direct relationship among FinTech, financial knowledge, and consumer financial satisfaction, but the influence channels are still under exploration. From the perspective of consumption structure, the application of FinTech such as mobile payments will increase the proportion of enjoying consumption, while higher financial knowledge often means stronger financial management ability and self-planning [38]. Thus, this study puts forward the hypothesis as follows:

H2: Financial knowledge positively contributes to the impacts of FinTech on consumer non-cash payment satisfaction, and that is, the higher level of financial knowledge, the more likely FinTech is to enhance consumer non-cash payment satisfaction.

3. METHODOLOGY

3.1 Data

In this study, the data is from the China Household Finance Survey (CHFS) in 2017. The size of interviewed households is 40,011, which covers 29 provinces in China. The questionnaire includes the following information, namely demographic characteristics, assets and liabilities, insurance and security, expenditure and income, financial knowledge, subjective attitude, as well as family members' information. In addition to the basic situation of household finance, the data of FinTech, consumer non-cash payment satisfaction, and financial knowledge are also incorporated. Moreover, to produce more accurate results, the samples whose household heads are older than 65 or younger than 18 are excluded. Thus, the sample size in this study is 12,642.

3.2 Variables

In this study, the dependent variable is consumer non-cash payment satisfaction, which is scored on a 1-to-5 scale. Respondents are answered as "What is your overall assessment of the non-cash payment services you currently receive?", and the responses range from 1 (Very satisfied) to 5 (Very dissatisfied). Following the approach of Dohmen et al. [39], this study recoded this scale reversely concerning non-cash payment satisfaction, as a way to make the connection between non-cash payment satisfaction of consumers and FinTech more easily. Therefore, if the respondent's answer is "Very satisfied", the variable is coded as 5, and "Very dissatisfied" is coded as 1.

The independent variable in this study is FinTech, which is measured by a related question as follows. Respondents are asked how they will pay for their purchases with four options, namely by cash, by swiping the card (including bank card and credit card), by using the computer (including online banking and Alipay), and by mobile terminals' apps (including the Alipay APP, WeChat payment, mobile banking, and Apple Pay). If the respondent selects the latter two options, it shows they will apply FinTech to the payment of living expenses, and the variable is encoded 1, 0 otherwise.

This study selects financial knowledge as the moderating variable. Generally, financial knowledge is measured from both subjective and objective aspects. The former is measured by self-evaluation of the consumer financial knowledge level based on their understanding of a series of financial issues, and the latter is constructed by whether the interviewees can correctly answer a series of financial questions. Abreu and Margarida [40] suggested that subjective financial knowledge is affected by the degree of confidence of investors. Therefore, the

objective financial knowledge obtained by designing a questionnaire on financial knowledge-related issues can more accurately reflect the true level of consumer financial knowledge than by examining subjective financial knowledge. The moderating variable of financial knowledge is measured by nine related questions in the survey, involving the interest rate calculation, the understanding of inflation, bond prices, mortgages, and risk diversification. If the question can be answered correctly, it is encoded 1 and 0 otherwise. A comprehensive index measuring financial knowledge is constructed through the sum of nine-question scores, ranging from 0 to 9.

Table 1. Variable specification

Type	Label	Meaning	Attribute
Dependent variable	*ncashsat*	Consumer non-cash payment satisfaction	From 1 = very satisfied to 5 = very dissatisfied
Independent variable	*ftpay*	The measure of whether FinTech is applied to households, according to how they will pay for their purchases	1 = cash, 2 = swiping the card (including bank card and credit card), 3 = paying through the computer (including online banking and Alipay), and 4 = paying through mobile terminals (including the Alipay APP, WeChat payment, mobile banking, and Apple Pay)
Moderating variable	*finknw*	The financial knowledge level of the household head	A sum of 9 related questions including compound interest rates (two questions included), inflation, bond prices, mortgages, and risk diversification are applied to measure consumers' objective financial knowledge
Control variables	*gender*	Gender of the household head	1 = male, 0 = female
	age	Age of the household head	From 18 to 65
	edu1	High school or lower	1 = yes, 0 = no
	edu2	Undergraduate and some college	1 = yes, 0 = no
	edu3	Master degree or higher	1 = yes, 0 = no
	marriage	Marital status of the household head	1 = married, 0 = not married
	health	Health status of the household head	From 1 = very bad to 5 = very good
	havebusiness	Whether the household head has a private business	1 = yes, 0 = no
	havehouse	Whether the household head has a house	1 = yes, 0 = no
	riskatt	The risk attitude of the household head when investing	From 5=High risk and high return projects to 1=Not willing to take any risks
	urban	Style of hukou of the household head	1 = urban, 0 = rural
	lnasset	The size of household total asset	The logarithm of the asset size
	lnincome	The size of household total income	The logarithm of the income size
	lnconspt	The size of household total consumption	The logarithm of the consumption size

Note: All of the binary variables are appropriately recorded specifically to the corresponding variables from the original dataset

As many factors will affect consumer non-cash payment satisfaction, to reduce the estimation bias caused by missing variables, this study introduces a series of control variables. The control variables in this study are divided into three categories. The first category is the demographic characteristic variables of the household head, including gender, age, education level, marital status, health level, and risk attitude. The second group includes household characteristic variables such as whether or not having a private business, whether or not having a house, total income, total assets, and total consumption. The third group is regional characteristic variables, which include urban (two categories, urban vs. rural) and provincial dummy variables. Table 1 presents the specification of the variables.

3.3 Data Analysis

As for the estimation method, since the dependent variable of consumer non-cash payment satisfaction (ncashsat) is measured by an ordered discrete variable, such as being extremely dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, and extremely satisfied. To produce more accurate estimates, the approach of ordered logit regression is utilized in this study. Simultaneously, the method of Ordinary Least Squares (OLS) is also used to generate estimated results, which can be compared with the estimated results using ordered logit regression. Thus, the econometric model is specified as follows:

$$ncashsat_i = \alpha_0 + \emptyset * ftpay_i + \sum_{k=1}^{M} \varphi_k * cv_{k,i} + \varepsilon_i \tag{1}$$

In Equation (1), $ncashsat_i$ stands for the dependent variable of consumer non-cash payment satisfaction, $ftpay_i$ denotes the variable of the payments with FinTech. Besides, $cv_{k,i}$ is a series of control variables such as demographic characteristics, household characteristics, and socio-economic characteristics, in which the superscript *M* represents the number of control variables. More specifically, $\emptyset$ and φ_k are the coefficients of FinTech and control variables. Moreover, α_0 and ε_i are the constant term and random error term, respectively.

3.4 Statistical Description

Table 2 presents the results of the descriptive statistics. For the dependent variables, the average value of non-cash payment satisfaction is 4.055 on the 5-point scale, which indicates that consumers generally hold a positive view of the non-cash payment services they currently receive. For the independent variable, the mean of FinTech pay is 0.850 on the 1-point scale, showing that most people will choose to pay through computers, mobile phones, pad, and other mobile terminals, which also reflects that non-cash payment methods brought by FinTech have been deeply integrated into consumers' daily lives.

Table 2. Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
ncashsat	12,642	4.055	0.687	1	5
ftpay	12,642	0.850	0.357	0	1
gender	12,642	0.782	0.413	0	1
age	12,642	44.389	10.693	18	65
edu1	12,642	0.375	0.484	0	1
edu2	12,642	0.422	0.494	0	1
edu3	12,642	0.203	0.402	0	1
marriage	12,642	0.873	0.333	0	1
havebusiness	12,642	0.252	0.434	0	1
havehouse	12,642	0.795	0.403	0	1
riskatt	12,642	0.975	1.467	0	5
urban	12,642	0.878	0.328	0	1
lnasset	12,642	13.620	1.513	0	17.217
lnincome	12,642	11.193	1.909	0	15.425
lnconspt	12,642	11.185	0.679	8.334	13.816

For control variables, the results of descriptive statistics reveal that the average age of the respondents is 44.389, 78.2% are male, and 87.3% are married. The average values of household total assets, income, and consumption are 13.620, 11.193, and 11.185, respectively. As for education, the ratios for junior high school or lower, high school and some college, and undergraduate and higher are 37.5%, 42.3%, and 20.3%, respectively. Besides, the average score for risk attitude is 0.975 measured out of 5 points, indicating that most of the respondents are risk-averse. For household characteristic variables, 25.2% have a private business and 79.5% have a house.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1 Results of Correlation Analysis

Table 3 displays the results of correlations between FinTech and consumer non-cash payment satisfaction. The results show that FinTech is positively associated with consumer financial satisfaction with non-cash payment. Meanwhile, most correlations are as expected. Furthermore, most correlation coefficients are less than 0.3, which means that there will be little estimation bias caused by multicollinearity.

4.2 Results of the OLS and Ordered Logit Regressions

To produce more accurate estimation results, the approaches of ordered logit regression, as well as the OLS regression, are utilized in the empirical analysis (see Table 4). Additionally, to avoid the effect of provincial differences, province dummy variables are included in all regressions. Table 4 reports the regression results of FinTech on consumer financial satisfaction with non-cash payment. Columns (1)

and (2) present the regression results of the OLS regression, and Columns (3) and (4) show the regression results of the ordered logit estimates. More specifically, in Columns (1) and (3), only control variables are entered, and in Columns (2) and (4), the independent variable of consumer payments with FinTech is incorporated.

The regression results specific to the approaches of OLS and ordered logit regressions reported in Columns (2) and (4) are almost the same in terms of sign and significance, both of them are statistically positive. The results indicate that FinTech is positive to consumer financial satisfaction with non-cash payment, suggesting that FinTech has a significant effect on improving consumer non-cash payment satisfaction. Thus, the results are as hypothesized in H1.

Concerning control variables, the results in Columns (1) and (3) show that both age and marital status are negative and significant. This shows that younger consumers are more satisfied with non-cash payments, since they are more sensitive and willing to accept the changes brought about by FinTech. Married consumers are much less satisfied with non-cash payments. Also, compared with men, non-cash payment can improve women's non-cash payment satisfaction, which may be related to the fact that women are primarily responsible for caring for the elderly and children in the home, and they are more sensitive to changes in the financial environment. The coefficients of education level and risk attitude are both significantly positive. A good education will improve consumer financial satisfaction with non-cash payments. The increase in the degree of risk preference will also promote consumer satisfaction with non-cash payments. Higher risk preference will enhance consumers' participation in financial markets and improve non-cash payment experiences.

Table 3. Correlations between FinTech and consumer non-cash payment satisfaction

Variables	Ncashsat	Ftpay	Have business	Have house	Lnasset	Lnincome	Lnconspt
ftpay	0.083***						
havebusiness	0.065***	0.071***					
havehouse	-0.004	-0.079***	-0.011				
lnasset	0.090***	-0.007	0.136***	0.387***			
lnincome	0.052***	0.006	-0.050***	0.084***	0.303***		
lnconspt	0.085***	0.075***	0.155***	-0.011	0.448***	0.254***	
riskatt	0.063***	0.058***	0.003	-0.173***	0.022***	0.004	0.107***

*Notes: Sample size = 12642. Besides, ***, ** and * denote statistical significance at 1%, 5%, and 10%, respectively*

Table 4. Results of regressions of FinTech on consumer non-cash payment satisfaction

Variables	(1)	(2)	(3)	(4)
Constant	3.316***	3.235***		
	(0.121)	(0.122)		
ftpay		0.124***		0.354***
		(0.018)		(0.053)
gender	-0.013	-0.017	-0.033	-0.042
	(0.015)	(0.015)	(0.043)	(0.044)
age	-0.004***	-0.003***	-0.012***	-0.010***
	(0.001)	(0.001)	(0.002)	(0.002)
edu2	0.020	0.023	0.049	0.057
	(0.015)	(0.015)	(0.043)	(0.043)
edu3	0.067***	0.068***	0.170***	0.172***
	(0.019)	(0.019)	(0.056)	(0.056)
marriage	-0.060***	-0.057***	-0.194***	-0.182***
	(0.020)	(0.020)	(0.059)	(0.059)
havebusiness	0.080***	0.076***	0.225***	0.214***
	(0.015)	(0.015)	(0.043)	(0.043)
havehouse	-0.022	-0.021	-0.072	-0.069
	(0.018)	(0.018)	(0.053)	(0.053)
riskatt	0.016***	0.016***	0.044***	0.044***
	(0.004)	(0.004)	(0.012)	(0.012)
urban	-0.025	-0.026	-0.075	-0.076
	(0.021)	(0.021)	(0.062)	(0.062)
lnasset	0.040***	0.040***	0.120***	0.120***
	(0.006)	(0.006)	(0.017)	(0.017)
lnincome	0.009***	0.009**	0.027**	0.026**
	(0.004)	(0.004)	(0.011)	(0.011)
lnconspt	0.028**	0.024**	0.087***	0.078**
	(0.011)	(0.011)	(0.031)	(0.031)
Province fixed effect	Yes	Yes	Yes	Yes
N	12,642	12,642	12,642	12,642
Adjusted *R*^{2}	0.031	0.035		
Pseudo *R*^{2}			0.017	0.019

Notes: ***, **, and * represent 1%, 5%, and 10% significance levels respectively, and the data in parentheses are robust standard errors.

4.3 Robustness

To verify the robustness of the estimation results, following the approaches of Chen et al. [41], a comprehensive check has been conducted in this study. Firstly, an alternative method is employed to perform re-estimations. In this study, the approach of ordered logit regression is replaced by the method of ordered probit regression. Secondly, the independent variable, which is whether to apply FinTech when paying for purchases, is replaced by the variable of whether to purchase goods online. Thirdly, in light of the health status, the samples are divided into healthy and unhealthy groups. Specifically, if the value of the consumer's health status is greater than 3, the sample is included in the healthy group; otherwise, it is incorporated in the unhealthy group. Additionally, to eliminate the estimation bias caused by the outliers of consumption, this study excludes the bottom 5% and top 5% of households with a relatively low and high consumption expenditure.

Table 5 shows the results of the robustness check. In Column (1), the results using the approach of ordered probit regression are presented. In Column (2), the results after the replacement of the variable for Fintech, with the new variable whether to purchase goods online are reported. In Columns (3) and (4), regressions are performed in light of the samples with different health statuses, respectively. Also, in Column (5), households with the top 5% and bottom 5% consumption expenditure are excluded. In Columns (1), (3), (4), and (5), the coefficients of FinTech (*ftpay*) remain statistically positive, which implies that FinTech contributes

to enhancing consumer non-cash payment satisfaction. When Fintech is replaced by purchasing goods online in Column (2), the coefficient of the variable (*netby*) is still positive and significant. Therefore, the results of the robustness check are still consistent with H1.

4.4 Further Discussion on the Moderating Role of Financial Knowledge

In the recent decade, the emergence and application of FinTech are convenient and inclusive for the dissemination of information and knowledge. As financial knowledge is closely related to the application of FinTech, there may be interactive effects between FinTech and financial knowledge in the process of influencing consumer financial satisfaction with non-cash payments. Therefore, this study constructs the interactive term of FinTech and financial knowledge (*ftpay*finknw*) to explore the influence

channels that how FinTech affects consumer non-cash payment satisfaction via financial knowledge.

The moderating role of financial knowledge is examined by the following specifications. First, the direct effect of FinTech and financial knowledge on consumer non-cash payment satisfaction are examined, respectively. In Columns (1) and (2) of Table 6, both FinTech and financial knowledge positively contribute to consumer non-cash payment satisfaction, which implies that the more consumers know about financial markets and financial products, the higher their satisfaction with non-cash payments. Second, the indirect effect of FinTech on consumer non-cash payment satisfaction via financial knowledge is verified through estimating the coefficient of the interactive term (*ftpay*finknw*). Since FinTech is measured by a dummy variable and financial knowledge is

Table 5. Results of robustness check

Variables	(1)	(2)	(3)	(4)	(5)
ftpay	0.201***		0.359***	0.424**	0.354***
	(0.029)		(0.055)	(0.181)	(0.055)
netby		0.370***			
		(0.038)			
gender	-0.026	-0.020	-0.049	-0.027	-0.046
	(0.025)	(0.044)	(0.045)	(0.184)	(0.046)
age	-0.006***	-0.008***	-0.010***	0.000	-0.011***
	(0.001)	(0.002)	(0.002)	(0.008)	(0.002)
edu2	0.035	0.017	0.059	0.116	0.075
	(0.024)	(0.043)	(0.045)	(0.167)	(0.045)
edu3	0.110***	0.130**	0.174***	0.321	0.202***
	(0.032)	(0.056)	(0.058)	(0.322)	(0.059)
marriage	-0.096***	-0.197***	-0.169***	-0.171	-0.148**
	(0.034)	(0.059)	(0.061)	(0.211)	(0.062)
havebusiness	0.125***	0.223***	0.233***	0.152	0.201***
	(0.025)	(0.043)	(0.044)	(0.199)	(0.045)
havehouse	-0.034	-0.063	-0.071	-0.398*	-0.134**
	(0.030)	(0.053)	(0.055)	(0.211)	(0.056)
riskatt	0.026***	0.040***	0.046***	0.039	0.037***
	(0.007)	(0.012)	(0.013)	(0.059)	(0.013)
urban	-0.044	-0.100	-0.093	0.054	-0.051
	(0.034)	(0.062)	(0.065)	(0.187)	(0.067)
lnasset	0.066***	0.112***	0.140***	0.063	0.137***
	(0.010)	(0.017)	(0.017)	(0.056)	(0.017)
lnincome	0.015**	0.025**	0.030***	0.011	0.031***
	(0.006)	(0.011)	(0.011)	(0.044)	(0.012)
lnconspt	0.042**	0.072**			
	(0.018)	(0.031)			
Province fixed effect	Yes	Yes	Yes	Yes	Yes
N	12,642	12,642	11,830	812	11377
Pseudo R^2	0.019	0.020	0.019	0.027	0.018

Note: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively

Table 6. Regression results of the moderating role of consumer financial knowledge

Variables	(1)	(2)	(3)
ftpay	0.354***		
	(0.053)		
finknw		0.101***	
		(0.018)	
ftpay*finknw			0.130***
			(0.015)
gender	-0.042	-0.027	-0.032
	(0.044)	(0.044)	(0.044)
age	-0.010***	-0.011***	-0.010***
	(0.002)	(0.002)	(0.002)
edu2	0.057	0.034	0.039
	(0.043)	(0.043)	(0.043)
edu3	0.172***	0.139**	0.133**
	(0.056)	(0.056)	(0.056)
marriage	-0.182***	-0.194***	-0.184***
	(0.059)	(0.059)	(0.059)
havebusiness	0.214***	0.228***	0.219***
	(0.043)	(0.043)	(0.043)
havehouse	-0.069	-0.058	-0.053
	(0.053)	(0.053)	(0.053)
riskatt	0.044***	0.004	-0.002
	(0.012)	(0.015)	(0.014)
urban	-0.076	-0.087	-0.089
	(0.062)	(0.062)	(0.062)
lnasset	0.120***	0.114***	0.114***
	(0.017)	(0.017)	(0.017)
lnincome	0.026**	0.026**	0.026**
	(0.011)	(0.011)	(0.011)
lnconspt	0.078**	0.089***	0.080**
	(0.031)	(0.031)	(0.031)
Province fixed effect	Yes	Yes	Yes
N	12642	12642	12642
Pseudo R^2	0.018	0.018	0.019

*Note: ***, ** and * represent 1%, 5%, and 10% significance levels, respectively*

measured by a categorized variable, they are highly correlated to their interactive term. Due to multicollinearity, only the interactive term is incorporated. The results are displayed in Column (3) of Table 6. More specifically, the coefficient of the interactive term of FinTech and financial knowledge is positive at a significance of 1%. Hence, financial knowledge is verified as a moderator, which reveals that the higher level of financial knowledge, the more likely FinTech is to enhance consumer non-cash payment satisfaction. Thus, the results are as expected in H2.

5. CONCLUSIONS AND IMPLICATIONS

FinTech has grown tremendously in the recent decade, enabling consumers to make payments in a safe, secure, and convenient way without the use of cash. The combination of non-cash payments and mobile terminals has greatly broken through the time and space limitations of consumption, making consumption a ready-to-use behavior and having become the mainstream in consumers' daily lives. Therefore, utilizing data from the CHFS in 2017, this study is conducted to investigate the effect of FinTech on consumer non-cash payment satisfaction as well as the moderating role of financial knowledge. The results indicate that there is a significant and positive association between FinTech and consumer non-cash payment satisfaction, and that is, FinTech will promote the application of the non-cash payments and thereby improving consumer non-cash payment satisfaction. Moreover, financial knowledge plays a moderating role in the positive relationship between FinTech and consumer non-cash

payment satisfaction, which implies that financial knowledge positively enhances the impacts of FinTech on consumer non-cash payment satisfaction. As the blending of finance and technology, FinTech has played a substantial role in easing financial exclusion and improving payment convenience. In this study, financial knowledge is considered to be positive to help consumers master FinTech apps and further improve consumer wellbeing in non-cash payments.

Based on the conclusions, measures to improve consumers' financial knowledge level and make FinTech better improve consumer satisfaction are strategically highlighted from the following perspectives. First, financial institutions are encouraged to actively adopt the latest applications of FinTech and promote the upgrading of hardware equipment. These measures are positive to improve their levels of non-cash and informatization. Second, policymakers are recommended to formulate related regulations to effectively guide the development of non-cash payment instruments. This will be to construct an online consumption environment with guaranteed product quality and secure electronic payment. Third, as financial knowledge does play a significant role in FinTech positively affecting consumer non-cash payment satisfaction, financial education programs are encouraged to be carried out to make consumers more financially literate.

Two limitations in this study can be further improved. First, the estimated value obtained by using panel data spanning a longer period will be more robust, while it cannot be implemented at the moment due to data availability. Future research can combine consecutive multi-year indicators from multiple databases to further investigate the effect of FinTech on consumer non-cash payment satisfaction from a vertical perspective. Second, the effects of other factors on consumer non-cash satisfaction also need to be considered in further investigation. For instance, the factors of expectation for the future, and relative income among different cohorts may vitally affect consumer financial satisfaction with non-cash payments.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Thakor AV. Fintech and banking: What do we know? Journal of Financial Intermoderation. 2020;41:100833.
2. Chandler N, Krajcsák Z. Intrapreneurial fit and misfit: Enterprising behavior, preferred organizational and open innovation culture. Journal of Open Innovation: Technology, Market, and Complexity. 2021;7(1):61.
3. Iman N. Is mobile payment still relevant in the FinTech era? Electronic Commerce Research and Applications. 2018;30:72-82.
4. Kang J. Mobile payment in FinTech environment: Trends, security challenges, and services. Human-centric Computing and Information Sciences. 2018;8(1):1-16.
5. Wulandari D, Soseco T, Narmaditya BS. Analysis of the use of electronic money in efforts to support the less cash society. International Finance and Banking. 2016; 3(1):1-10.
6. Agarwal S, Chua YH. FinTech and household finance: A review of the empirical literature. China Finance Review International. 2020;10(4):361-376.
7. Lim SH, Kim DJ, Hur Y, Park K. An empirical study of the impacts of perceived security and knowledge on continuous intention to use mobile fintech payment services. International Journal of Human-Computer Interaction. 2019;35(10):886-898.

8. Chen X, You X, Chang V. FinTech and commercial banks' performance in China: A leap forward or survival of the fittest? Technological Forecasting and Social Change. 2021;166:120645.

9. Jünger M, Mietzner M. Banking goes digital: The adoption of FinTech services by German households. Finance Research Letters. 2020;34:101260.

10. Saksonova S, Kuzmina-Merlino I. Fintech as financial innovation–The possibilities and problems of implementation. European Research Studies Journal. 2017; 20(3A):961-973.

11. Nunan D, Di Domenico M. Big data: A normal accident waiting to happen? Journal of Business Ethics. 2017; 145(3):481-491.

12. Gai K, Qiu M, Sun X, Zhao H. Security and privacy issues: A survey on FinTech. International Conference on Smart Computing and Communication. 2016; 10135:236-247.

13. Huang Y, Huang Z. The development of digital finance in China: Present and future. China Economic Quarterly. 2018; 17(4):205-218.

14. Khan KA, Akhtar MA. Electronic payment system use: A mediator and a predictor of financial satisfaction. Investment Management and Financial Innovations. 2020;17(3):246-262.

15. Lantang AP, Pangemanan SS, Tielung MV. The influence of ease of use and facility towards customer satisfaction on fintech digital payment. Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi. 2021;9(4):406-414.

16. Odeyinka HA, Kaka A. An evaluation of contractors' satisfaction with payment terms influencing construction cash flow. Journal of Financial Management of Property and Construction. 2005; 10(3):171-180.

17. Shim S, Xiao JJ, Barber BL, Lyons AC. Pathways to life success: A conceptual model of financial well-being for young adults. Journal of Applied Developmental Psychology. 2009;30(6):708-723.

18. Alwi S, Alpandi RM, Salleh MNM, Najihah I. An empirical study on the customers' satisfaction on FinTech mobile payment services in Malaysia. International Journal of Advanced Science and Technology. 2019;28(16):390-400.

19. Zhang L, Kim H. The influence of financial service characteristics on use intention through customer satisfaction with mobile fintech. Journal of System and Management Sciences. 2020;10(2):82-94.

20. Panos GA, Wilson JO. Financial literacy and responsible finance in the FinTech era: capabilities and challenges. The European Journal of Finance. 2020;26(4-5):297-301.

21. Gomber P, Kauffman RJ, Parker C, Weber BW. On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. Journal of Management Information Systems. 2018;35(1):220-265.

22. Jagtiani J, Lemieux C. Do fintech lenders penetrate areas that are underserved by traditional banks? Journal of Economics and Business. 2018;100:43-54.

23. Kong ST, Loubere N. Digitally down to the countryside: Fintech and rural development in China. The Journal of Development Studies. 2021;57(10):1739-1754.

24. Gomber P, Koch JA, Siering M. Digital finance and FinTech: Current research and future research directions. Journal of Business Economics. 2017;87(5):537-580.

25. Kahneman D, Diener E, Schwarz N. Well-being: Foundations of hedonic psychology. Russell Sage Foundation, NewYork; 1999.

26. Xiao JJ, Chen C, Chen F. Consumer financial capability and financial satisfaction. Social Indicators Research. 2014;118(1):415-432.

27. Xiao JJ. Consumer financial capability and wellbeing. Handbook of Consumer Finance Research. 2016;1:3-17.

28. Joo Sh, Grable JE. An exploratory framework of the determinants of financial satisfaction. Journal of Family and Economic Issues. 2004;25(1):25-50.

29. Vlaev I, Elliott A. Financial well-being components. Social Indicators Research. 2014;118(3):1103-1123.

30. Campbell JY, Mankiw NG. The response of consumption to income: a cross-country investigation. European Economic Review. 1991;35(4):723-756.

31. Mettler A, Williams AD. The rise of the micro-multinational: How freelancers and technology-savvy start-ups are driving growth, jobs and innovation. Lisbon Council Policy Brief. 2011;5(3):1-28.

32. Bayero MA. Effects of cashless economy policy on financial inclusion in Nigeria: An

exploratory study. Procedia-Social and Behavioral Sciences. 2015;172:49-56.

33. Bourreau M, Valletti T. Enabling digital financial inclusion through improvements in competition and interoperability: What works and what doesn't. CGD Policy Paper. 2015;65:1-30.

34. Murphy JL. Psychosocial factors and financial literacy. Social Security Bulletin. 2013;73(1):73.

35. Philippas ND, Avdoulas C. Financial literacy and financial well-being among generation-Z university students: Evidence from Greece. The European Journal of Finance. 2020;26(4-5):360-381.

36. Akin GG, Aysan AF, Ozcelik S, Yildiran L. Credit card satisfaction and financial literacy: Evidence from an emerging market economy. Emerging Markets Finance and Trade. 2012;48(5):103-115.

37. Engels C, Kumar K, Philip D. Financial literacy and fraud detection. The European Journal of Finance. 2020;26(4-5):420-442.

38. Henager, R., and Cude, B. J. Financial literacy and long-and short -term financial behavior in different age groups. Journal of Financial Counseling and Planning, 2016, 27(1): 3-19.

39. Dohmen T, Falk A, Huffman D, Sunde U, Schupp J, Wagner GG. Individual risk attitudes: Measurement, determinants, and behavioral consequences. Journal of the European Economic Association. 2011; 9(3):522-550.

40. Abreu M, Mendes V. Financial literacy and portfolio diversification. Quantitative finance. 2010;10(5):515-528.

41. Chen F, Hsu CL, Lin AJ, Li H. Holding risky financial assets and subjective wellbeing: Empirical evidence from China. The North American Journal of Economics and Finance. 2020;54:101142.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/78791