Who Uses Mobile Payments: Fintech Potential in Users and Non-Users

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This study used data from the 2015 National Financial Capability Study to analyze the adoption of mobile payments by U.S. households. While 24% of respondents used mobile payments, the mean rate for those under age 25 was 11 times the rate for those 65 and older. State rates ranged from about 9% in Montana to 34% in Washington, DC. Based on a logistic regression, age and an objective financial knowledge score were negatively while risk tolerance and a subjective financial knowledge score were positively related to mobile payment use. The results have implications for marketing of Fintech applications for personal finance, especially in terms of the extremely low mobile payment use by older consumers.

Keywords: elderly, Fintech, financial literacy, mobile payments, mobile technology, National Financial Capability Study

The adoption of mobile payments in the United States has been increasing, but the volume of transactions is relatively small compared to some other countries (Statista.com, 2018). A mobile payment is defined as "purchases, bill payments, charitable donations, payments to another person, or any other payments made using a mobile phone. This includes using your phone to pay for something in a store as well as payments made through an App, a mobile web browser or text message" (Federal Reserve Board, 2016, p.7). In order to use mobile payments, consumers need to link their mobile payments account to their credit card or debit card (Anderson, 2015). Both commercial companies and financial institutions have made efforts to increase mobile payment use, based on the high rate of mobile phone use, with 87% of the U.S. population above age 18 using a mobile phone, and 77% of those using smartphones (Federal Reserve Board, 2016, p.4). The prevalence of mobile phones is increasing not only in entertainment areas but also in financial services, which leads to more and more consumers having access to online shopping, online banking, budgets, and payments through their mobile phone. A more recent development has been the rapid increase in the use of mobile payments, from the earliest uses about 1999 (Rampton, 2016).

Although mobile payments are being accepted by more consumers, our analysis of the 2015 National Financial Capability Study (NFCS) found that about 24% of respondents reported using mobile payments, with the rest presumably relying on some combination of cash, checks, and credit cards for transactions. In contrast, other countries have much higher rates of mobile payment use. According to Durden (2018), Sweden is going cashless, with consumers instead relying on mobile payments systems. Mobile payment use in China is over 40%, with much higher rates in some urban areas (Tencent Research Institution, 2017). However, U.S. consumers have not gotten used to cardless transactions such as mobile payments (Hoek, 2017), and about 80% of respondents said it is easier to use other payment methods rather than mobile payments, and about 65% of respondents thought they could not benefit from using mobile payments (Federal Reserve Board, 2016, p.18). Consumers also worry about their financial information being stolen when they use mobile payments (Emarketer.com, 2016; Federal Reserve Board, 2016, p.18; Hoek, 2017). The lack of infrastructure is another issue leading to the low adoption rate of mobile payments. In many parts of the United States, there is limited access to mobile payments (Hoek, 2017; Juniper Research, 2016).

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Researchers have been concerned for many years about the use of personal finance technology and financial behaviors. Carlsson, Larsson, Svensson, and Åström (2017) conducted a systematic literature review on the relationships between digital behaviors and personal financial behaviors, and found a large number of studies, although no simple conclusions could be drawn. Some researchers have concluded that the use of some types of technology is related to better financial behaviors, for instance, Hogarth and Anguelov (2004) concluded that e-banking users tended to make better personal finance decisions. However, Lusardi (2018) noted that younger consumers who used mobile payments were more likely than non-users to have a variety of bad financial practices. Garrett, Rodermund, Anderson, Berkowitz and Robb (2014) focused on testing the effects of consumer characteristics, knowledge, satisfaction, and some financial practices that affected the likelihood of using mobile payments.

Because of the complexity in disentangling causal effects between mobile payment use and other financial behaviors, we focus on the effects of consumer characteristics and location on mobile payment use. We then suggest future research that would provide more rigorous insight into the relationships between mobile payment use and bad financial practices. Lusardi (2018) suggested that the adoption of mobile payments will provide opportunities for development of Fintech solutions that could help mobile payment users make better decisions. Our research provides better insight into which consumers are most likely and which consumers are least likely to use mobile payments, as we find that there are extreme variations in the likelihood of mobile payment use.

Thus, the main purpose of this study is to identify factors related to mobile payment use. Although some researchers have discussed the effects of demographic characteristics on the adoption of mobile payments, previous studies have used only a limited number of characteristics and did not control for its availability. By controlling for many household and respondent characteristics, as well as for a proxy for availability of vendors providing for mobile payments, we identified some factors that have implications for the adoption of Fintech applications.

Relevant Theories

Diffusion of Innovation Theory

Previous studies have treated mobile payments as a technology innovation and analyzed consumer's intentions to accept mobile payments based on some adoption theories. One theory is the diffusion of innovation theory (DOI; Rogers, 2010), which classifies adopters into five categories: innovators, early adopter, early majority, late majority, and laggards. The reason for the classification is that people who adopt an innovation at a different time have different characteristics. LaMorte (2018) identified five factors influencing the adoption of an innovation: relative advantage, complexity, compatibility, triability, and observability. The DOI theory has been applied widely to analyze the adoption of financial and mobile technologies (Lee & Lee, 2000; Plouffe, Hulland, & Vandenbosch, 2001; Szmigin & Bourne, 1999).

Mallat (2007) applied the DOI theory to mobile payments, with a qualitative study with six focus groups to investigate the acceptance of mobile payments. Mallat (2007) concluded that the low acceptance of mobile payments by merchants, plus perceptions of complexity and risk, were barriers to mobile payment use. There have been other studies that used the DOI theory to study acceptance of other personal finance technology, including Li, Lee, and Cude (2002), who investigated the adoption of online trading. They concluded that risk tolerance was positively related, and age was negatively related to the use of online trading.

Technology Acceptance Model

Another popular theory used to explain the adoption of mobile payments is the technology acceptance model (TAM). The TAM (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) posits two main factors, an individual's perceived usefulness (PU) and perceived ease of use (PEOU) of a new technology. The TAM has been seen as an extension of the theory of planned behavior (Ajzen, 1991; Bagozzi, 2007).

There are many empirical studies about the adoption of mobile payments based on the TAM. The TAM is commonly used as a basic model to investigate the use of mobile

payments. Researchers have added some new variables to make the TAM model more robust (Arning & Ziefle, 2007; Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014; Porter & Donthu, 2006; Schierz, Schilke, & Wirtz, 2010; Yeo & Fisher, 2017). Schierz et al. (2010) combined the TAM and the theory of planned behavior in their analytic model. They examined the effects of consumer's perceived compatibility, perceived security, PU, PEOU, individual mobility, and subjective norm on consumer's attitude towards use and positive associations between those factors and the intention to use mobile payments. Liébana-Cabanillas et al. (2014) found results similar to those of Schierz et al. (2010)'s and concluded that risk has a negative relationship with the intention to use mobile payments.

Literature Review and Hypotheses

Demographics Factors Related to the Mobile Payment Adoption

The diffusion of innovation theory claims that people adopt an innovation at different times (e.g., early stage, late stage) because of their different personality traits. But there is little agreement on what personality traits affect an adoption. While there have been many studies of the adoption of mobile payments, these studies have provided limited evidence on the effects of household characteristics on mobile payment use. A number of researchers have concluded that age is very important to the adoption of technology (Akman & Mishra, 2010; Arning & Ziefle, 2007; Federal Reserve Board, 2016; Garrett et al., 2014; Liébana-Cabanillas et al., 2014; Phang et al., 2006; Porter & Donthu, 2006). Older consumers tend to have a lower capability to learn new tasks (Hertzog & Hultsch, 2000) and older consumers' PEOU toward mobile payments might be lower than younger consumers. Mobile payments are associated closely with one's mobile lifestyle (Tencent Research Institution, 2017). Young generations are more likely to adopt a mobile lifestyle, in which they have a high-frequency use of mobile phones for socializing, conducting transactions, and so forth (Shankar, Venkatesh, Hofacker, & Naik, 2010). Older generations are less exposed to mobile payments and tend to have a lower likelihood of using mobile payments. It is possible that older generations tend to have anxiety-provoking situation when they try to learn use mobile payments, which people tend to avoid due to the lower PEOU. Thus, we propose Hypothesis 1:

> **H1:** Younger consumers are more likely to adopt mobile payments than older consumers.

Some researchers analyzed the relationship between the adoption of technology and gender through the theory of planned behavior and TAM (Morris, Venkatesh, & Ackerman, 2005; Venkatesh & Morris, 2000). Empirical research in Internet industry (Akman & Mishra, 2010; Arning & Ziefle 2007) showed that male adults have higher PU than female adults and males tend to use the Internet more often than females. When women make decisions, they are more affected by PEOU and subjective norm (Morris et al., 2005). Therefore, we propose Hypothesis 2:

> **H2:** Males are more likely to adopt mobile payments than females.

To make a mobile payment, consumers need to link their credit card or debit card with a mobile payment account. Typically, in the United States, only banked consumers are more able to adopt mobile payments. Minorities such as Black, Hispanic, and Asian households are more likely to be unbanked than White households (Rhine & Greene, 2013). The banked rates of Black, Hispanic, and Asian households are all lower than that of White households (FDIC, 2016). Based on the higher rate of being unbanked, our Hypothesis 3 is that minorities would be less likely to adopt mobile payments.

> **H3:** Minorities are less likely to adopt mobile payments than Whites.

The diffusion of innovation theory claims that more knowledge is required when adopting a complex technology. For the early adopters, they have the ability to adopt an innovation because of higher education level (Rogers, 2010). Empirical research has shown the relationship between the adoption of technology and education level. For example, Agarwal and Prasad (1999) illustrated that there is a positive relationship between education level and PEOU. Therefore, Hypothesis 4 is:

> **H4:** The likelihood of using mobile payments will increase with education.

Perceived cost is a barrier to the acceptance of mobile payments (Mallat, 2007; Wu & Wang, 2005). Consumers pay a

transaction fee through the higher price of the product, such as a vending machine. Thus, consumers with lower income might not want to pay the fees to access mobile payments. Hypothesis 5 is:

> **H5:** The likelihood of using mobile payments will increase with income.

Perceived risk is a barrier of the adoption of a new technology (Liébana-Cabanillas et al., 2014; Pavlou, 2003; Wu & Wang, 2005; Yeo & Fisher, 2017). Consumers worry about the security of mobile banking and mobile payments (Federal Reserve Board, 2016). Perceived risk plays a crucial role in the adoption of mobile payments. Wu and Wang (2005) found a significant relationship between perceived risk and the intention to use mobile payments. It is possible that consumers' risk attitude affects the acceptance of mobile payments, thus, Hypothesis 6:

> **H6:** The likelihood of using mobile payments will increase with risk tolerance.

Consumers' financial knowledge or financial literacy affects their financial decisions. Tokar Asaad (2015) suggested that while objective financial knowledge is related to better financial decisions, subjective financial knowledge is related to worse financial decisions. A number of studies have found that objective and subjective knowledge affects financial decisions and financial satisfaction (e.g., Xiao & Porto, 2017). Financial overconfidence is defined based on having high subjective financial knowledge relative to one's objective financial knowledge. Overconfident consumers are more likely to underestimate risk (Goel & Thakor, 2008). Kim, Lee, and Hanna (2019) reviewed several studies on the effect of financial overconfidence and found that overconfident consumers had a higher likelihood of mortgage delinquency. Mobile payments have their own risks. From this viewpoint, overconfidence might affect consumer decisions about using mobile payments, therefore, we have Hypothesis 7, which has two components:

> **H7a:** Consumers with higher subjective financial knowledge are more likely to adopt mobile payments.

> **H7b:** Consumers with lower objective financial knowledge are more likely to adopt mobile payments.

Whether consumers can make mobile payments depends on the acceptance of mobile payments by merchants (Mallat, 2007). The lack of infrastructure of in-store mobile payments hinders the prevalence of mobile payments (Juniper Research, 2016). Therefore, Hypothesis 8 is:

> **H8**: Residents living in states with higher adoption rates are more likely to use mobile payments**.**

Previous Studies on the Adoption of Mobile Payments and Financial Behaviors

Some research studies have discussed the relationship between the adoption of mobile payments and finance behaviors. Garrett et al. (2014) found that consumers who use mobile payments are more likely to have high-cost debt, trouble with financial management, bad credit card behaviors, and low financial knowledge level. Garrett et al. (2014) also claimed that mobile payment users tend to impulse spend. Yeo and Fisher (2017) investigated the determinants of the adoption of mobile service for tasks related to personal finance. They found that the adoption of mobile financial services is influenced by perceived behavioral control, subjective norms, and PU. Lusardi (2018) focused on the financial behaviors and financial literacy of mobile payment users among millennials aged 18–34 and found that millennial mobile payment users are more likely to have financial problems and have less financial knowledge than non-users. However, the researchers who found relationships between mobile payment use and financial problems did not properly account for the endogeneity of mobile payment use and financial problems. Because previous research on adoption of mobile payments has not adequately controlled for both household characteristics and merchant availability, we limited our focus to ascertaining factors related to mobile payment use.

Methodology

Dataset and Sample Selection

We used the 2015 NFCS managed and released by the Financial Industry Regulatory Authority (FINRA) Investor Education Foundation. From 2009, FINRA Investor Education Foundation has sponsored the national survey every 3 years. The online survey provides key indicators of financial capability as well as demographic, behavioral, attitudinal,

and financial literacy characteristics. This dataset has been used frequently in analyses of financial literacy and behavior (e.g., Aboagye & Jung, 2018; Moreland, 2018; Wagner, 2019). The 2015 NFCS contains 27,564 adult respondents across all 50 states and the District of Columbia. We excluded cases with respondents who did not provide a valid response to the question about mobile payment use and the independent variables, resulting in an analytic sample with 19,748 respondents. We separately analyzed mobile payment use among all households, without excluding households with missing data for the independent variables and found only small differences in mobile payment use (results are available from authors upon requests).

Dependent Variable

The dependent variable is based on a question about mobile payments in the 2015 NFCS. The question is "How often do you use your mobile phone to pay for a product or service in person at a store, gas station, or restaurant (e.g., by waving/tapping your mobile phone over a sensor at checkout, scanning a barcode or QR code using your mobile phone, or using some other mobile app at checkout)?" The choices presented were "Frequently", "Sometimes", "Never", "Don't know," and "Prefer not to say." This question has been newly added to the 2015 NFCS with a detailed description. For the multivariate analysis, we defined the dependent variable as a dichotomous variable; the answers "Frequently" and "Sometimes" are coded as "1", and the answer "Never" is coded as "0". "Don't know" and "Prefer not to say" are deleted in the research.

Independent Variables

The independent variables include age, age squared, gender, marital status, race/ethnicity, education, household income, employment status, risk tolerance, objective financial knowledge, and subjective financial knowledge. We also included the mean adoption rate of the state of residence. For in-store mobile payments, the consumer's adoption of mobile payments depends on the infrastructure of retail stores. As discussed above, the lack of infrastructure is a crucial reason for the low adoption rate of mobile payments in the United States. It is possible that the mean rate for the respondent's state reflects both availability of vendors offering mobile payments and demand factors, such as peer effects, but addition of the state rate to our analysis did not substantially change the estimated effects of respondent characteristics, so we present our logit results with the mean state rate as one of the independent variables.

Data Analyses

Logistic regression is an appropriate method for multivariate analysis with a dichotomous dependent variable. We tried an ordered logistic regression (logit) to differentiate between the frequently and sometimes responses, but a score test indicated that the parallel assumption of ordered logit was violated, and the results were not substantially different from a logit based on the dichotomous dependent variable, use or not. Both descriptive and multivariate results were weighted using the NFCS survey weight variable. To illustrate the effects of independent variables in the logit, we followed Allison (1999, p.14) in transforming the coefficients estimated in a logistic regression to likelihoods. Note that odds ratios commonly listed for logit results should not be discussed in terms of differences in likelihoods.

Results

Descriptive Results

Table 1 shows the percentage of respondents who used mobile payments in each state in the United States. The rate varied across states, ranging from 8.88% for Montana to 34.13% for the District of Columbia. We compared some financial behaviors for mobile payment users and non-users, and the patterns were similar to those reported by Lusardi (2018) and by Garrett et al. (2014), with generally worse behaviors for mobile payment users, for example, almost 42% of those reporting paying late fees on credit were users, versus 21% for those who did not pay late fees (results available from the authors).

Descriptive results for sample characteristics are shown in Table 2. The respondents are categorized into "Use" for those who used mobile payments frequently or sometimes, and about 24% of respondents reported using mobile payments. Over 76% reported never using, 18% reported sometimes using, and about 6% reported frequently using mobile payments. There was a strong relationship between age and use, with the rate for those under 25 (51%) almost 11 times as high as the rate for those 65 and older. Male respondents had higher rates than females. White respondents had lower rates than those in other racial/ethnic groups. There was not a substantial variation in the adoption rate between different education levels. Similarly, the adoption rate did not vary in

TABLE 1. Percent Using Mobile Payments, by State, Arranged from Lowest to Highest, 2015 NFCS

States	Number Valid Responses	Percent Using
Total sample	27,236	23.83
Montana	497	8.88
Wisconsin	499	12.79
Maine	495	13.10
South Dakota	496	13.15
West Virginia	497	13.40
Wyoming	498	13.60
Idaho	497	13.90
North Dakota	496	14.34
Iowa	499	15.19
Vermont	496	15.87
Nebraska	495	17.10
Ohio	493	17.21
Pennsylvania	492	18.36
Alaska	494	18.46
Michigan	492	18.57
New Hampshire	495	18.67
Oregon	497	18.70
Kansas	493	18.86
Minnesota	496	19.76
Indiana	496	19.83
Kentucky	496	19.87
Tennessee	498	20.14
New Mexico	498	20.19
North Carolina	496	20.29
Oklahoma	496	20.61
Delaware	498	20.75
Utah	497	21.07
Arkansas	497	21.08
South Carolina	495	21.16
Mississippi	497	21.96
Louisiana	492	22.70
Missouri	497	22.72
Hawaii	493	22.84
Alabama	499	23.49
Massachusetts	495	23.49
Nevada	493	24.36
Maryland	495	24.38
Colorado	488	24.43
Rhode Island	495	25.41

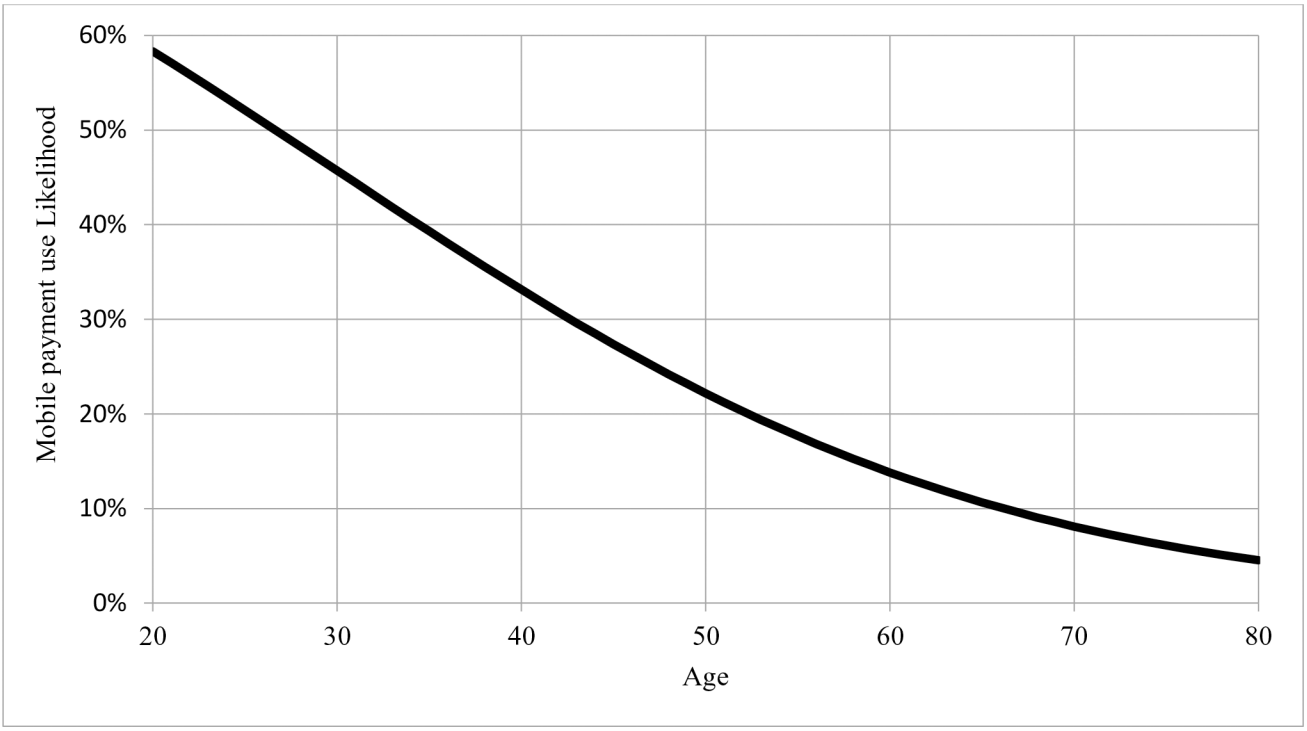
(*Continued*)

TABLE 1. Percent Using Mobile Payments, by State, Arranged from Lowest to Highest, 2015 NFCS *(Continued)*

States	Number Valid Responses	Percent Using
Connecticut	496	25.41
Florida	495	25.78
Illinois	989	26.38
Arizona	492	26.79
Georgia	495	26.84
Washington	495	27.16
Virginia	500	27.42
New Jersey	497	29.91
Texas	983	30.06
California	988	33.59
New York	983	33.61
District of Columbia	495	34.13

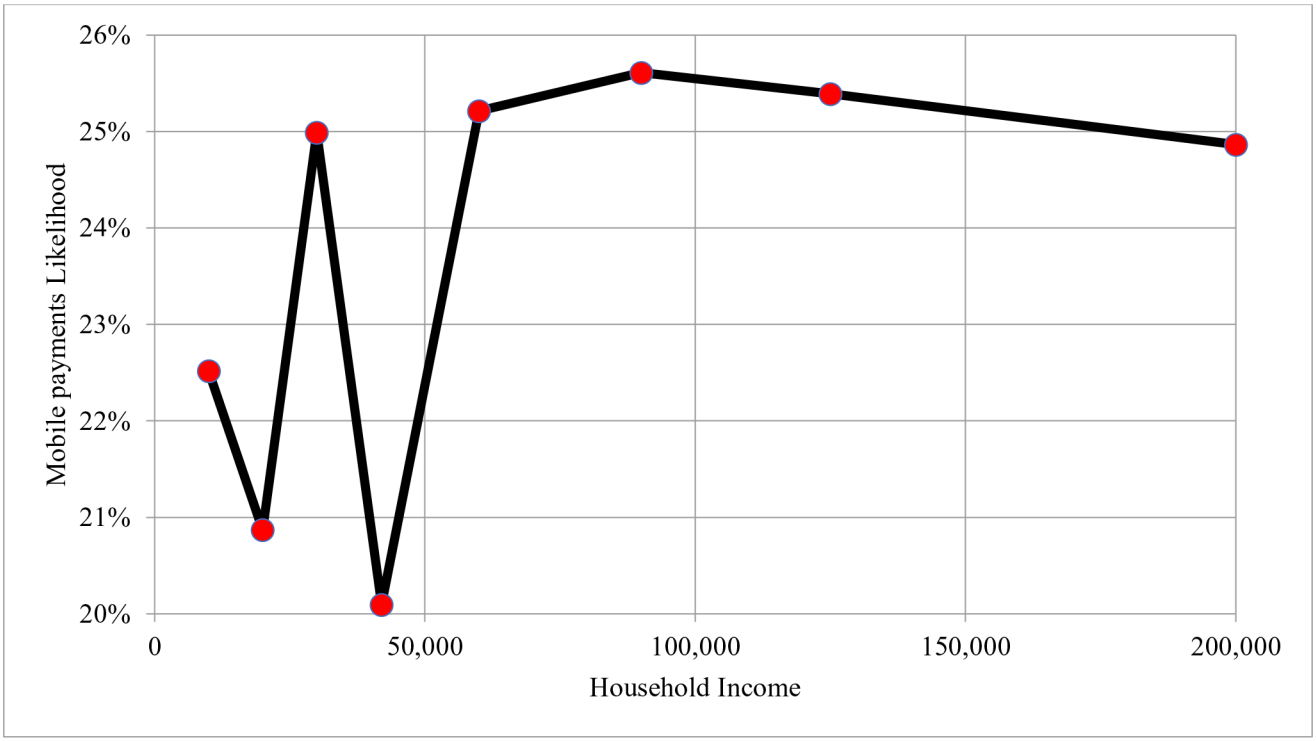
Note. Weighted percentages. NFCS = National Financial Capability Study.

Figure 1. Predicted likelihood of mobile payment use by age of respondent, at mean values of other variables, 2015 NFCS.



Note. Author's calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

Figure 2. Predicted likelihood of mobile payment use by household income, at mean values of other variables, 2015 NFCS.



Note. Author's calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

TABLE 2. Descriptive Results for the Adoption of Mobile Payments, by Categorical Variables, 2015 NFCS

Variables	Distribution in Sample (*N* = 19,748)	Percent Using (*N* 4,401)
Total Sample (%)	100.00	23.83
Age Group (%)		
18–24	8.04	50.56
25–34	17.86	45.48
35–44	14.63	33.42
45–54	20.18	20.56
55–64	18.04	8.91
65 and older	21.24	4.70
Gender (%)		
Male	50.46	27.41
Female	49.54	20.19
Marital Status (%)		
Married	59.12	22.39
Single, never married	25.72	34.07

(*Continued*)

TABLE 2. Descriptive Results for the Adoption of Mobile Payments, by Categorical Variables, 2015 NFCS *(Continued)*

Variables	Distribution in Sample (*N* = 19,748)	Percent Using (*N* 4,401)
Separated	1.12	24.47
Divorced	9.71	13.27
Widowed/widower	4.32	6.18
Race/Ethnicity (%)		
White	68.27	18.04
Black	9.56	34.46
Hispanic	14.42	38.74
Asian	5.78	37.77
Other	1.97	23.03
Education (%)		
Less than high school	1.39	20.24
High school graduate (regular high school diploma)	16.21	19.51
High school graduate (or alternative credential)	5.82	24.92
Some college, no degree	30.45	22.07
Associate degree	12.43	24.18
Bachelor's degree	20.37	27.18
Post-bachelor's degree	13.33	27.59
Income (%)		
Less than $15,000	6.32	24.35
$15,000–$24,999	8.70	20.48
$25,000–$34,999	9.90	25.24
$35,000–$49,999	15.47	19.41
$50,000–$74,999	22.68	24.70
$75,000–$99,999	15.33	25.98
$100,000 to $149,999	14.60	25.13
$150,000–more	6.99	25.11
Employment Status (%)		
Self-employed	7.22	24.94
Work full time	43.29	32.83
Work part time	8.97	25.27
Homemaker	7.60	19.02
Full-time student	3.72	43.65
Disabled	2.85	8.06
Unemployed	3.68	26.11
Retired	22.67	5.70

(*Continued*)

TABLE 2. Descriptive Results for the Adoption of Mobile Payments, by Categorical Variables, 2015 NFCS *(Continued)*

Variables	Distribution in Sample (*N* = 19,748)	Percent Using (*N* 4,401)
Objective Financial Knowledge Score		
0	3.84	38.69
1	9.42	39.54
2	17.70	34.02
3	23.71	21.87
4	26.57	16.32
5	18.76	16.42
Subjective Assessment of Financial Knowledge		
1	1.08	29.89
2	0.90	16.13
3	3.38	15.45
4	11.81	18.67
5	35.91	20.24
6	32.03	24.52
7	15.61	36.28

Note. Weighted percentages. NFCS = National Financial Capability Study.

TABLE 3. Descriptive Results, Mean Risk Tolerance, and Objective and Subjective Financial Knowledge Scores by Adoption of Mobile payments, 2015 NFCS

Variables	Do Not Use Mobile Payments (*N* = 15,347)	Use Mobile Payments (*N* = 4,401)
Risk tolerance, range 1–10 (mean score)	4.90	6.96
Objective financial knowledge, range 0–5 (mean score)	3.31	2.69
Subjective financial knowledge, range 1–7 (mean score)	5.31	5.60

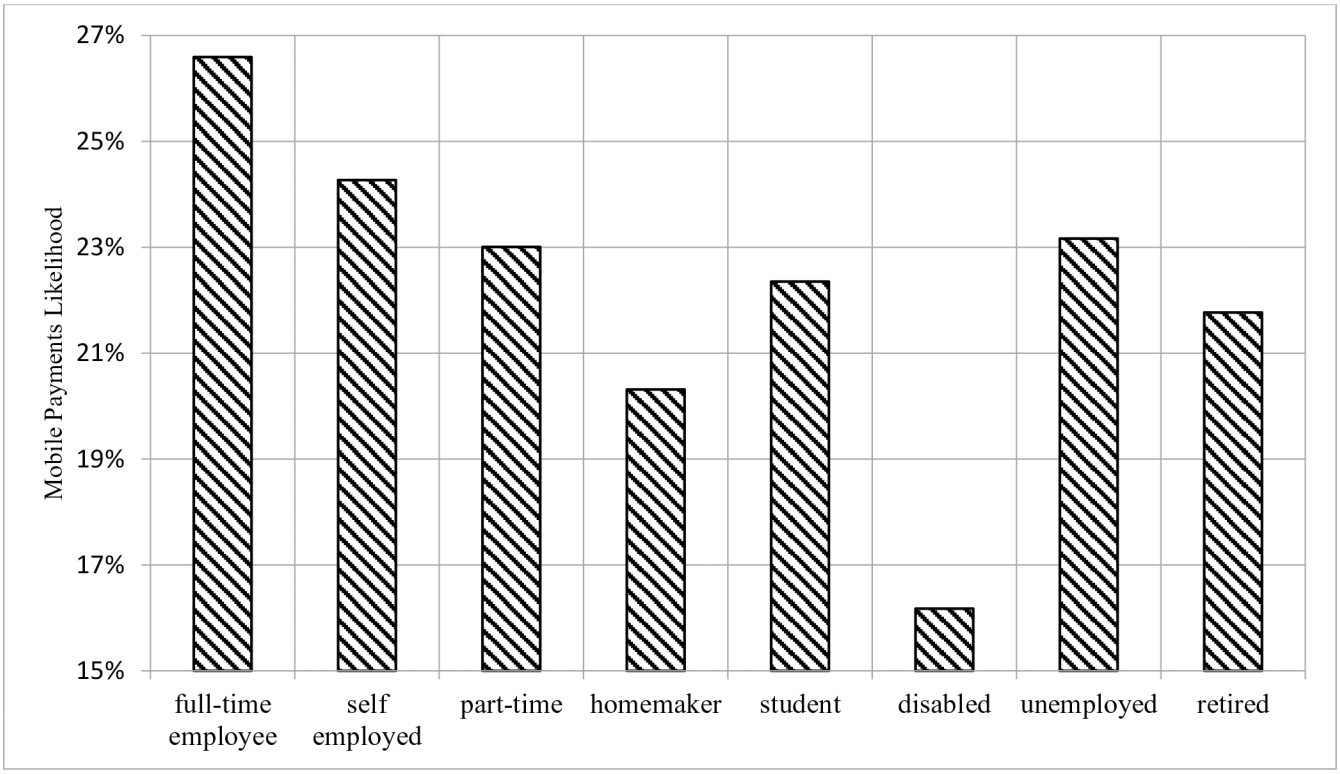
Note. Weighted results. NFCS = National Financial Capability Study.

a consistent way between income levels. Full-time students were the most likely of all job categories to use mobile payments (44%) and retired respondents were the least likely (6%). Respondents who used mobile payments had a higher mean value of risk tolerance than those who did not use mobile payments (Table 3). Respondents who used mobile payments had a lower mean objective financial knowledge score but a higher mean subjective financial knowledge score than those who did not use mobile payments (Table 3).

Multivariate Results

The results from a logistic regression are shown in Table 4. We also ran the same model without controlling for the mean state rate, and the results were very similar. The combined effect of age and age squared implies that the likelihood of mobile payment use decreases with age. Figure 1 shows the predicted likelihood by age, at mean values of other variables, based on the logistic regression results. For respondents with mean values of other variables, the

Figure 3. Predicted likelihood of mobile payment use by employment status, at mean values of other variables, 2015 NFCS.



Note. Author's calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

predicted likelihood of using mobile payments for a 20-year-old adult is almost 10 times the likelihood for a 75-year-old adult.

Female respondents had a lower predicted likelihood of use (21%) than similar male respondents (25%). Respondents in a couple relationship had a higher predicted rate (25%) than similar never married respondents (21%). White respondents had a lower predicted rate (22%) than otherwise similar Black (30%), Hispanic (27%), or Asian (29%) respondents. Respondents with post-bachelor's degree had a higher predicted rate (27%) than those with a high school degree or less (22%). Households in higher income categories had somewhat higher likelihoods of using mobile payments than those in lower income categories, though the pattern, as with the descriptive results shown in Table 2, was not consistent (Figure 2). Full-time workers were more likely to adopt mobile payments than those in most of the other categories such as disabled and retired (Figure 3).

Risk tolerance was positively associated with the mobile payments likelihood, with the predicted rate for those with the highest level of risk tolerance almost five times that rate for otherwise similar households with the lowest level risk tolerance (Figure 4). The respondent's objective financial knowledge score was negatively related to the mobile payment use (Figure 5), while the respondent's subjective assessment of financial knowledge was positively associated with mobile payment use (Figure 6). Lastly, the mean mobile payment use rate in the state of residence was positively related to the respondent's likelihood of using mobile payments, and a respondent who lived in the state with the highest mean rate had a predicted likelihood of mobile payment use almost three times as high as an otherwise similar respondent who lived in the state with the lowest mean rate.

Discussion

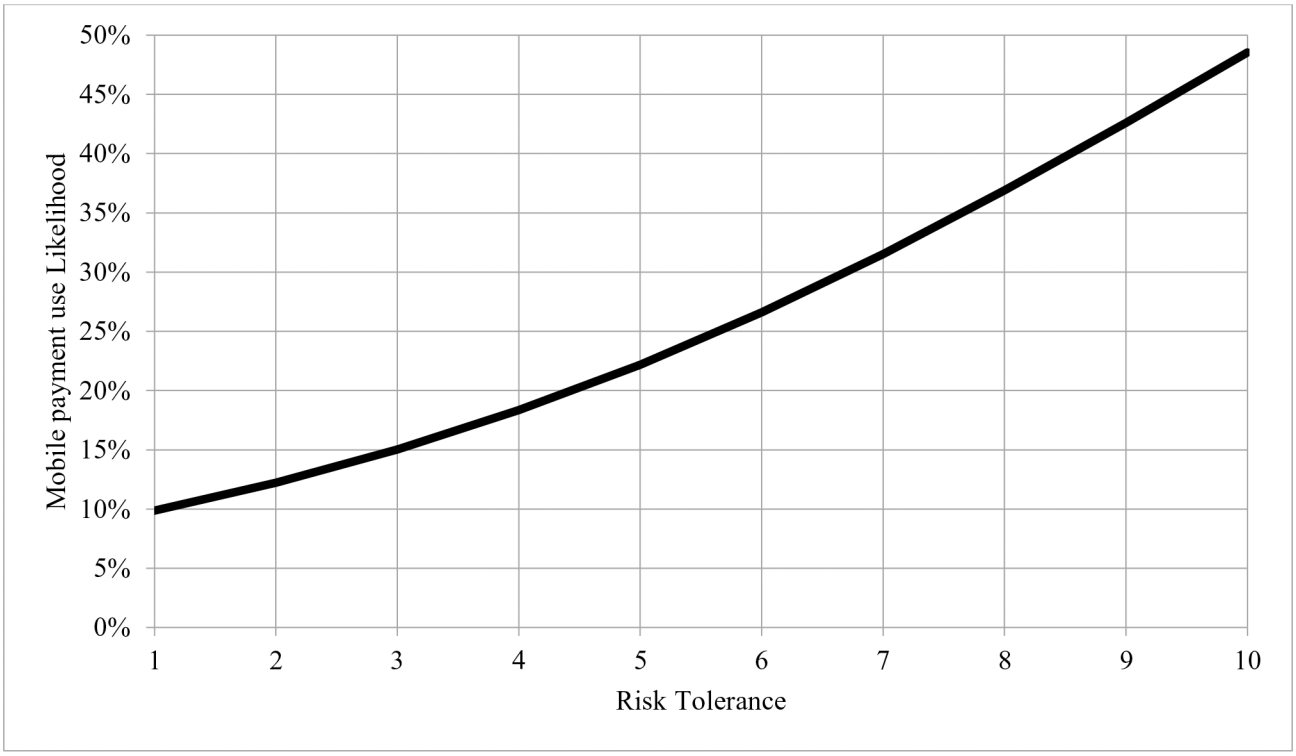
Based on the logit results in Table 4, age was negatively related to mobile payment use, supporting Hypothesis 1.

TABLE 4. Logistic Regression on the Adoption of Mobile Payments, 2015 NFCS

Variable	Coefficient	Standard Error	*p* Value
Age/100	−4.5094	1.0169	< .0001
Age squared/10000	−1.1300	1.1573	.3288
Female (Ref: Male)	−0.1718	0.0438	< .0001
Marital status (Ref: Married)			
Single, never married	−0.2434	−0.0531	< .0001
Divorced/separated/widowed/widower	−0.0197	0.0734	.7883
Race/ethnicity (Ref: White)			
Black	0.3970	0.0671	< .0001
Hispanic	0.2699	0.0551	< .0001
Asian	0.3786	0.0788	< .0001
Other	0.0679	0.1394	.6259
Education (Ref: High school or less)			
Some college	0.0765	0.0549	.1638
Bachelor's degree	0.1195	0.0643	.0631
Post-bachelor's degree	0.2403	0.0744	.0012
Household income (Ref: $35,000–$49,999)			
< $15,000	0.1447	0.1031	.1603
$15,000–$24,999	0.0475	0.0931	.6095
$25,000–$34,999	0.2812	0.0848	.0009
$50,000–$74,999	0.2932	0.0689	< .0001
$75,000–$99,999	0.3141	0.0757	< .0001
$100,000–$149,999	0.3026	0.0783	.0001
$150,000 or more	0.2746	0.0957	.0041
Employment status (Ref: Work full time)			
Self-employed	−0.1223	0.0771	.1125
Part-time	−0.1923	0.0746	.0100
Homemaker	−0.3512	0.8050	< .0001
Full-time student	−0.2297	0.0996	.0211
Disabled	−0.6296	0.1740	.0003
Unemployed	−0.1836	0.1091	.0924
Retired	−0.2636	0.0981	.0072
Risk tolerance	0.2392	0.0092	< .0001
Objective financial knowledge score	−0.2508	0.0163	< .0001
Subjective financial knowledge	0.1737	0.0195	< .0001
State rate	3.8651	0.3202	< .0001
Intercept	−1.6548	0.2598	< .0001
Model fit			
Adjusted *R* squared	0.2330	–	–
Concordance rate (%)	81.6	–	–

Note. Weighted results. NFCS = National Financial Capability Study.

Figure 4. Predicted likelihood of mobile payment use by risk tolerance, at mean values of other variables, 2015 NFCS.



Note. Author calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

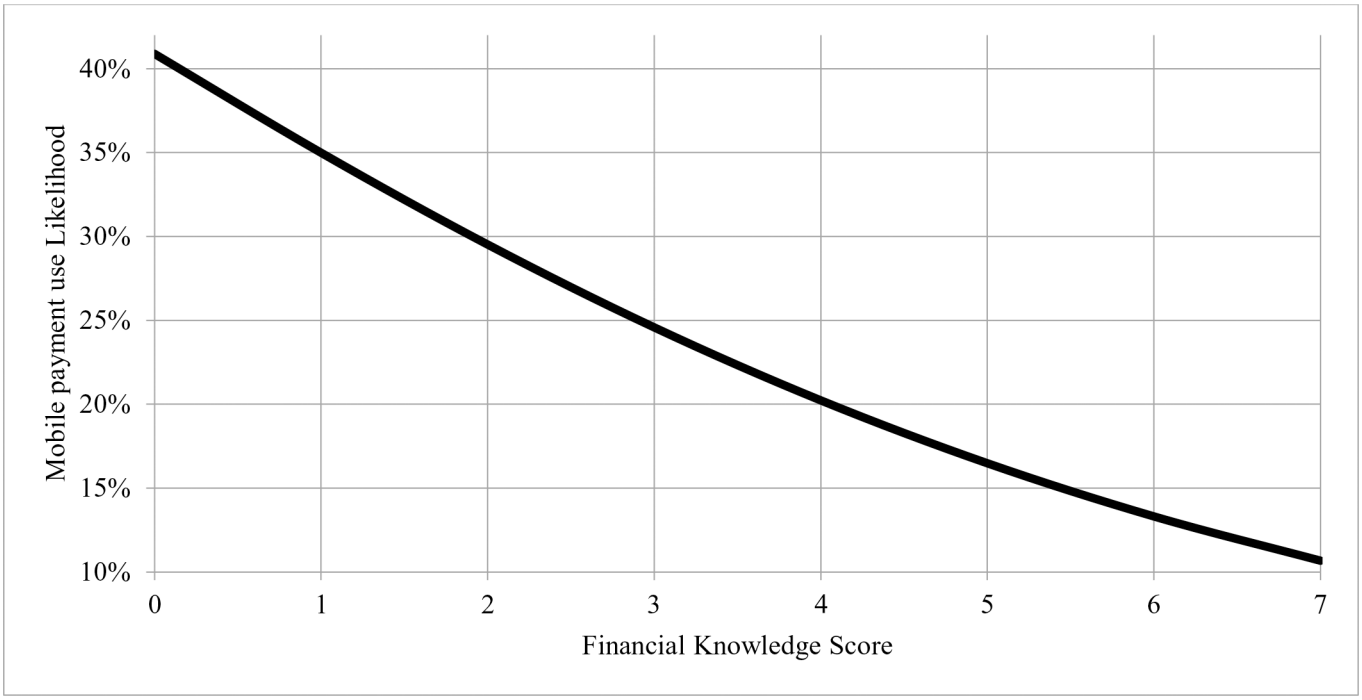
The result is consistent with many previous studies on technology acceptance (Akman & Mishra, 2010; Arning & Ziefle, 2007; Federal Reserve Board, 2016; Garrett et al., 2014; Liébana-Cabanillas et al., 2014; Phang wt al., 2006; Porter & Donthu, 2006). Our logit results in Table 4 also support Hypothesis 2, that males were more likely than females to use mobile payments, and this result is consistent with previous research (e.g., Akman & Mishra, 2010; Arning & Ziefle, 2007).

Black, Hispanic, and Asian respondents were significantly more likely to use mobile payments than otherwise similar White respondents, so Hypothesis 3 was rejected. Race or ethnicity has not been discussed frequently in research of technology adoption (Kolodinsky, Hogarth, & Hilgert, 2004). The higher rates for Hispanics and Asians compared to otherwise similar White respondents might be due to being not used to traditional banking and credit systems in the United States, so being more open to new payment methods.

Hypotheses 4 and 5 were partially supported, though there were not monotonic increases in the likelihood of use with education or income. Unlike some newer technology, mobile payment use is not complex or costly, so the lack of a consistent relationship between education and mobile payment use, and between income and mobile payment use, might be reasonable.

Risk tolerance was positively related to use, so Hypothesis 6 was supported, and this result is consistent with some previous research (e.g., Pavlou, 2003; Liébana-Cabanillas et al., 2014; Wu & Wang, 2005; Wu and Wang, 2005; Yeo & Fisher, 2017). The likelihood of using mobile payments increased with subjective financial knowledge and decreased with objective financial knowledge, which supports Hypotheses H7a andH7b. The combined effects of subjective and objective financial knowledge are consistent with other studies (e.g., Kim, Lee, & Hanna, 2019) that show overconfidence is related to riskier behavior.

Figure 5. Predicted likelihood of mobile payment use by objective financial knowledge score, at mean values of other variables, 2015 NFCS.



Note. Author calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

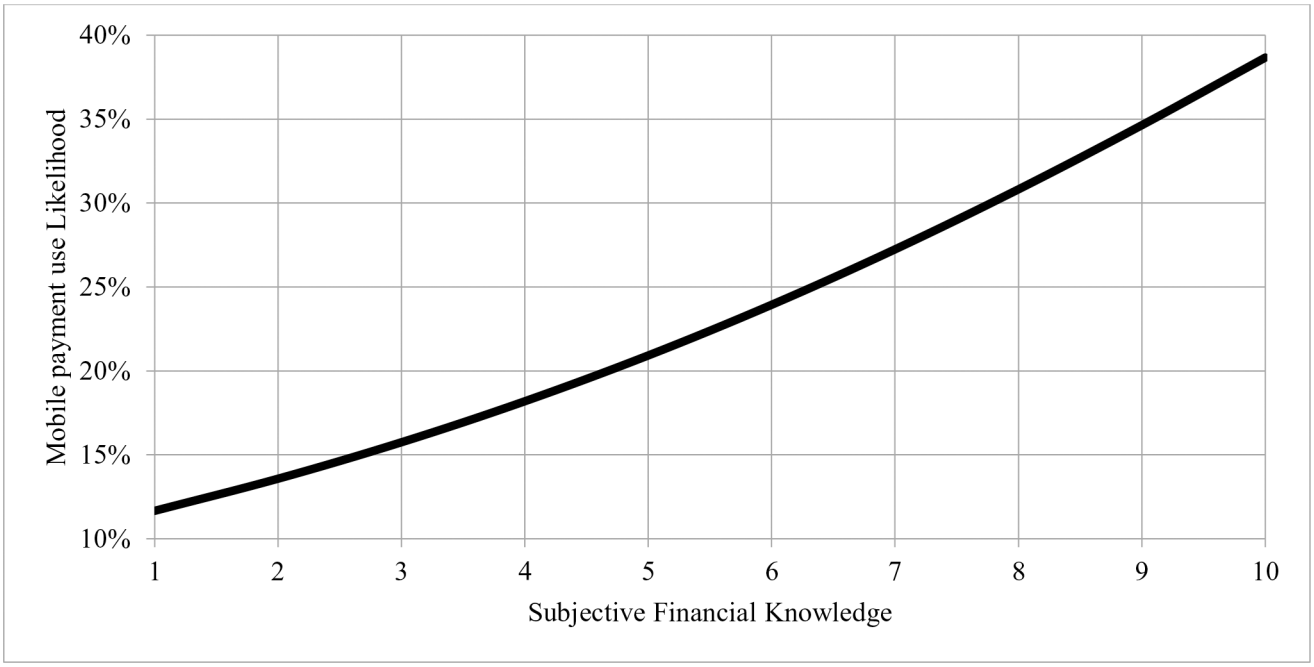
The positive relationship between the adoption rate of each state and respondent likelihood of use supported Hypothesis 8 and can be interpreted as the effect of mobile payments providers' or retailers' acceptance of mobile payments. Infrastructure is an important factor in determining the use of mobile payments. Thus, the benefits of using mobile payments will be higher because more merchants will allow mobile payments. The adoption rate also can represent the impact of subjective norms or social influence. The decision to use mobile payments is influenced by friends, family, colleagues, or mass media.

Contributions and Limitations

There has been limited research identifying to effects of household characteristics on mobile payment use, so our research provides more comprehensive insights into these effects. Garrett et al. (2014) tried to evaluate many demographic features in their model, but they included financial behavior variables as independent variables, so their estimates of effects of household characteristics are not necessarily valid because they did not address endogeneity issues in their model. Our logistic regression model provided evidence of a number of significant relationships between demographic characteristics and the adoption of mobile payments. We also estimated the impact of consumer's location, which had been neglected by previous studies.

There has been no publicly available data to calculate how many vendors accept mobile payments in each state. Therefore, we used the mean state rate as a proxy for vendor acceptance of mobile payments. We acknowledge that the mean rate might reflect not only the mobile payments infrastructure but also some demand factors, such as peer effects. This is a limitation of our study. If data becomes available on vendor acceptance of mobile payments, future research could provide more insights into factors related to mobile payment use. Another limitation is that we deleted about 28% of the respondents because of missing data in our independent variables and the mobile payment variable. But our sample size was still large, mobile payment use for our analytic sample was very similar to mobile payment use among the entire sample with no deletions for missing information in our independent variables.

Figure 6. Predicted likelihood of mobile payment use by subjective assessment of financial knowledge, at mean values of other variables, 2015 NFCS.



Note. Author's calculations based on logistic regression results shown in Table 4. NFCS = National Financial Capability Study.

Implications for the Development of Fintech Applications and Financial Professionals

Developers of Fintech applications should consider the characteristics of mobile payment users, as identified in our research. Smartphones may become a powerful tool of financial education (Association for Financial Counseling and Planning Education [AFCPE], 2014). People who use mobile payments would presumably be comfortable with using their smartphones for personal finance applications. The strong relationship between age and mobile payment use implies that younger consumers would be the best potential market for such applications. Given challenges for personal finance education targeted toward Black and Hispanic consumers, minority consumers would be a promising segment for Fintech applications. The mixed patterns we found for the effect of education, and the negative relationship between objective financial knowledge and mobile payment use suggest that there is a need for personal finance apps for mobile payment users. However, the positive relationship we found between subjective assessment of financial knowledge and mobile payment use suggests that many of these consumers might not think they need help with personal finance decisions. The strong negative relationship between age and the likelihood of using mobile payments also means that despite the promise of Fintech applications to help elderly consumers (Hayashi, 2019), there will be barriers to usage without a change in the patterns of use by older consumers.

The rate of mobile payment use increased substantially in recent years, from the 6% rate in the 2012 NFCS (Garrett et al., 2014) to the 24% rate we found in the 2015 NFCS. Despite the increase in use, however, financial advisors should take client characteristics into account when considering recommending Fintech applications. Older, lower income, and disabled consumers are less likely to use mobile payment apps, and therefore may be less likely to accept Fintech apps. Clients with high subjective assessment of their financial knowledge are more likely to use mobile payments, and may be more willing to accept Fintech apps, but may also overestimate their ability to understand financial decisions. Finally, clients who live in states with low mobile payment use may also be less willing to accept Fintech apps.

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