Adoption of Mobile Payment Technology by Consumers

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This study examined the use of mobile payments by American consumers. Using a sample of 15,060 respondents from all 50 states and the District of Columbia, a profile of mobile payment users was developed. Respondents who were using mobile payments were more likely to be younger, male, minorities, and to have a higher than average income. Results indicated that there were strong associations between mobile payment adoption and high cost debt (payday loans, auto-title loans, etc.), trouble with financial management (making ends meet), and credit card behavior (taking cash advances and paying over the limit fees). Results suggest that users of mobile payment technology were focused on convenience, and they might be prone to impulse spending. The potential impact of the increasing adoption of this technology is discussed.

Keywords: *diffusion of innovation; mobile payments; smart phones; technology*

Mobile technologies are increasingly commonplace and offer consumers a wide array of services and options. Eighty-seven percent of Americans owned a mobile phone in 2012, with over 50% owning a smartphone (Federal Reserve Board, 2013). The number of individuals with a mobile phone exceeds the number of individuals with a bank account (Porteous, 2006). The implications of these changes for consumer financial practices remain unknown as little research has explored this issue. Of central interest to this study is the degree to which the adoption of newer mobile technologies in personal finance is occurring. What is the purpose of adoption? Is it convenience or is it to assist consumers with complex financial decisions? This study focuses on consumer adoption of newer financial technologies by examining the use of mobile payments.

Global financial markets are increasingly becoming more complex as new products and technologies have provided alternatives in how consumers conduct their financial affairs. At the same time, consumers are increasingly interconnected due to the Internet as a means of information exchange. Consumers can be connected via mobile devices such as laptops, tablets, and smart phones. Smartphones offer an array of services beyond simple voice and text communication to consumers. Consumers are increasingly willing to interact

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with financial service providers online and through social platforms which allow mobile access to financial services 24 hr a day, 7 days per week, rendering distance from physical branch locations insignificant (Ascher, 2013; Chui et al., 2012).

In any quarter, nearly 60% of Internet users in the U.S. visit at least one of the top 20 financial institution sites. Wells Fargo business customers electronically deposited 468 million-plus paperless checks worth over $1 trillion in 2009 (WellsFargo.com, 2009). Individuals can view bank balances or transfer funds using their smartphones or tablets (Federal Reserve Board, 2013). Online-only financial service providers, such as Ally Bank, ING Direct, and PerkStreet, have begun to establish a foothold in the market with highly competitive products (Ascher, 2013; Griffith, 2011). Mobile devices have become a viable means of accessing online banking services and they are increasingly used to make onsite purchases. Smart phones can be scanned or swiped in the same manner as a debit or credit card at the point of sale (POS), further reducing transaction time.

REVIEW OF LITERATURE

Mobile payment behavior has not been studied by consumer and personal finance researchers. However, there are some related behaviors that might provide insight into mobile payment behavior. Emphasis is placed on online banking, credit card use, and socio-demographic factors. The online banking literature provides a historical perspective on the technology adoption process, whereas the use of credit cards illustrates consumers' reliance on convenience instruments.

Mobile Payments and Banking

Mobile payments are made using a mobile credit card or a mobile wallet, carried on a mobile device (Dahlberg, Mallat, Ondrus, & Zmijewska, 2008). Instead of having to pull out a credit card, or scan a debit card, and enter a personal identification number, a consumer using mobile payments merely scans a mobile device over a merchant's POS terminal to complete the purchase. The use of mobile payments makes purchasing goods easier, faster, and safer (Dahlberg, Mallat, & Öörni, 2003).

Adoption of this technology in the United States has been slow despite growing popularity in other countries. Japan generated $22 billion worth of contactless payments in 2009 compared to $1.5 billion in the United States (Hayashi, 2012). Although the number of Americans using mobile payments is increasing, it is growing slowly. In 2012, only 15% of mobile phone users reported making a mobile payment in the past 12 months (Federal Reserve Board, 2013). As 87% of the U.S. adult population has a mobile phone, and 15% of those with mobile phones have made a mobile payment in the last 12 months, the implication is that about 13% of Americans use mobile payments, with 6% of those payments representing POS purchases (Federal Reserve Board, 2013). Those who were most likely to use mobile payments were people under the age of 44, those with higher incomes, and minorities, although differences in usage based on race may be shrinking (Federal Reserve Board, 2013).

Based on his theory of diffusion of innovations, Rogers (2010) segmented those who adopt new technologies into five groups: innovators (2.5%), early adopters (13.5%), early majority (34%), later majority (34%, and laggards (16%). Based on this theory, the authors surmise that the estimated 13% of Americans who used mobile payments in 2012 were innovators and early adopters. Rogers (2010) noted that education was a critical differentiating factor, as individuals with higher education levels were more likely to be innovators or early adopters.

To develop a model, the authors examined research on adoption of online banking as a point of comparison. Even though there were functional differences between online banking (paying bills and managing accounts) and mobile payments (purchase of items with a mobile phone), the evolution of online banking can serve as a historical reference for adoption patterns and characteristics of users. About 7% of the U.S. population used online banking in 1998, with estimated usage growing to 35% by 2004 (Bell, Hogarth, & Robbins, 2009). Research indicated that income was the most influential demographic factor in determining adoption of online banking (Lassar, Manolis, & Lassar, 2005; Lee, Eastwood, & Lee, 2004). Kolodinsky, Hogarth, and Hilgert (2004) noted positive associations between the intent to adopt online banking in the next 12 months and age, education, income, and net worth. This research indicates some association between financial management and online banking behavior, although the effect was small and the data did not provide an indication of causality (Hogarth & Anguelov, 2004). There is less evidence on mobile banking behavior, although available data suggest that use of mobile banking services is growing, particularly among smartphone owners (Federal Reserve Board, 2013).

Most consumer research on mobile payments focuses on their acceptance, adoption, and use. Dahlberg et al. (2008) suggested that ease of use, usefulness, security, cost, and compatibility were the most important contributors to consumers' utilization of mobile payments. This mirrors the more recent Federal Reserve Board report, which cites convenience as the primary reason for use of mobile payments, noting that security concerns and a lack of suitable equipment such as a smart phone were the major deterrents (2013).

Whereas research has been done on factors that lead individuals to adopt and use mobile payment systems, little is known with regard to how the use of mobile payment impacts spending behaviors. Studies on spending behavior have focused very narrowly on mobile payments as a potential contributor to impulse buying. Such studies tend to emphasize the benefits to merchants of mobile payments, positioning these services as a means of increasing consumer impulse spending (Alliance, 2008). Mallat and Tuunainen (2008) hypothesized that impulse purchases will increase as mobile payments become more common. From a consumer perspective, mobile payments have been promoted for the benefit of convenience, with little attention to the potential downside of increased impulse spending.

Credit Card Use

There are 177 million credit cardholders in the United States who possess nearly 610 million cards (Bankrate Online Network, 2011). As of March 2012, nearly two in five (39%) Americans revolve, month-to-month, consumer debt of close to

$852 billion (CreditCards.com, n.d.; Federal Reserve, 2013). Credit cards are unique because they are a transaction medium (convenience) and a form of short-term borrowing. Historical data show that during the second half of the 20th Century, the revolving component of consumer credit increased relative to income, while the nonrevolving component decreased (Durkin, 2000). These findings are supported by Kim and DeVaney (2001) who noted a general rise in total debt, especially revolving debt, since the 1970s.

Many critics have blamed credit cards for the emphasis on current consumption over long-term planning and saving (Feinberg, 1986; Pinto, Parente, & Palmer, 2001). Effectively, the concept of saving is often marginalized whereas spending is viewed positively. Material possessions are often seen as determinants of one's status, power, and self-worth (Roberts & Jones, 2001). Roberts and Jones (2001) noted that many consumers have been raised in an environment characterized by easy access to credit, which has contributed to more positive attitudes toward debt. Roberts and Jones investigated the role money attitudes and credit card use play in compulsive buying among U.S. college students. Robert and Jones concluded that a student's use of credit cards reinforced the relationship between his or her attitude toward money and compulsive buying, suggesting that credit card usage exacerbates the problem of compulsive buying and fosters a culture of indebtedness. Data from the general population provide additional support as positive associations have been noted between favorable attitudes towards credit and balance levels (Chien & DeVaney, 2001). Other research has suggested that credit cards facilitate spending, with potential ramifications being overspending on the part of card holders (Feinberg, 1986).

Hence, the following hypotheses were proposed:

H_1: Younger consumers are more likely to adopt mobile payment technology relative to older consumers.
H_2: Minority consumers are more likely to adopt mobile payment technology relative to white respondents.
H_3: Consumers who have made an online payment in the previous 12 months are more likely to engage in mobile payments.
H_4: Users of mobile payments are more likely to be less financially stable in terms of income, bill management, use of alternative financial services, and prevalence of financial shocks.
H_5: Users of mobile payments are more likely to own multiple credit cards, with increasingly likelihood of use as the number of cards held increases.
H_6: Users of mobile payments are more likely to exhibit risky credit card use.
H_7: Less knowledgeable consumers and those with lower levels of education are more likely to report mobile payment behavior.
H_8: Mobile payment users are expected to be less financially satisfied relative to nonusers.
H_9: Banked individuals are more likely than unbanked individuals to report mobile payment behavior.
H_{10}: Consumers with higher levels of confidence and more positive attitudes toward risk are more likely to adopt mobile banking technology.

METHODOLOGY

Sample

Data were taken from the 2012 wave of the National Financial Capability Study (NFCS), of the FINRA Investor Education Foundation, under the direction of the

U.S. Department of the Treasury and the President's Advisory Council on Financial Literacy. The 2012 survey was the second wave of the NFCS. It was administered in July through October of 2012. The online survey polled 25,509 adults distributed across all 50 states and the District of Columbia, using nonprobability quota sampling (Lachance & Tang, 2012). Weights are provided to make the survey representative of census tracks in the United States.

Dependent Variables

The FINRA survey explores consumer mobile payment behavior based on the following question: "How often [do you/does your household] use each of the following methods to make payments (e.g. for shopping, for paying bills, or for any other purpose)?" There were eight subquestions, dealing with everything from cash to direct online payments. The eighth subquestion was of interest for this study, as it questioned whether individuals had ever made a mobile payment by "tapping/waving your mobile phone over a sensor at checkout." Possible responses included "frequently," "sometimes," "never," "don't know" or "prefer not to say." The dependent variable was coded as a dichotomous variable with anyone indicating "frequently" or "sometimes" using these services being coded as "1" and those indicating "never" being coded as "0." Individuals indicating "don't know" or "prefer not to say" were dropped from the analysis.

Independent Variables

Individuals reported use of online banking for making payments through a simple yes/no question, with "Yes" responses coded as 1 and "No" responses coded as 0. Consumer credit card behavior was assessed with this question: "In the past 12 months, which of the following describes your experience with credit cards?" There were six subquestions, and five were selected for this study. Each subquestion was had a "yes-no" response. The questions were as follows: "In some months, I carried over a balance and was charged interest," "In some months, I paid the minimum payment only," "In some months, I was charged a late fee for late payment," "In some months, I was charged an over the limit fee for exceeding my credit line," and "In some months, I used the cards for a cash advance."

For each of the five behaviors, a binary variable was created with the value set equal to 1 for "Yes" and 0 for "No." Observations where the reported answer was "Don't know" or "Prefer not to say" were not included. Respondents were also asked to report the number of credit cards they owned. This was included as a categorical variable.

Other independent variables including age, education level, income, gender, ethnicity, financial knowledge (objective and subjective), risk tolerance, and financial satisfaction were included based on previous research and whether the available question was in the survey. Financial satisfaction was measured using a single-item Likert-type scale, asking respondents to rate their satisfaction with their current financial condition on a scale of 1 ("Not At All Satisfied") to 10 ("Extremely Satisfied").

Financial knowledge was measured based on four multiple choice and two true/false questions. Individuals were also asked to self-assess their financial

knowledge on a 7-point Likert-type scale, with 1 indicating "Very Low" and 7 indicating "Very High." A number of personal financial factors were controlled for, including difficulty paying bills, whether individuals had experienced an adverse financial shock in the past year, utilization of high cost credit services (including payday loans, rent-to-own, pawn shops, auto-title loans, and refund anticipation loans), and whether individuals had a bank account.

Estimation Strategy

The analysis was concerned with evaluating the odds of a respondent making a mobile payment given the specified control variables. Logistic regression was used to predict reported adoption of mobile payment technology. The analysis was conducted to estimate the marginal effects of the independent variables on the dummy coded mobile payment variable.

RESULTS

Descriptive Statistics

Descriptive statistics are given for the full sample, and for groups of respondents who reported online banking and using a phone to make a purchase. See Table 1. A majority of respondents (81%) reported using online banking to make a payment, whereas only a small fraction (5.6%) indicated using a phone to make a mobile purchase. Those who used online banking were similar to the entire sample in demographics and characteristics. However, those who reported mobile purchase behavior were predominantly younger, male, minorities, less knowledgeable, and they displayed poor credit card behavior when compared to the entire sample.

Multivariate Analysis

Results from logistic regression are shown in Table 2. The dependent variable was a binary indicator for mobile payment behavior. Estimates indicated that mobile payment users differed significantly from nonusers in several characteristics. As hypothesized (H_1), younger consumers were more likely to report mobile payments based on the results. Compared with respondents ages 18–24, respondents were increasingly less likely to report making mobile payments. For example, those aged 35–44 were roughly 48% less likely than the youngest group to report making mobile payments, whereas those 65 or older were 85% less likely to do so. Respondents ages 25–34 were not statistically different from the youngest group.

Hypothesis 2 was supported. White respondents were 40% less likely to use mobile payments compared with non-whites. Individuals who made an online payment within the past year were two-and-a-half times more likely to report making mobile payments, lending support to the 3rd hypothesis. In terms of financial stability, the results provide a mixed message.

As hypothesized (H_4), the likelihood of making mobile payments was greater for respondents reporting difficulty paying bills (86% and 37%, respectively, for "very difficult" and "somewhat difficult"), those who reported any use of high cost credit services (159%) and those who reported experiencing an income

TABLE 1: Frequency and Means of National Financial Capability Study 2012

Variable	*Full Sample* (*n* = 15,060)	*Mobile Payment* (*n* = 847)	*Online Payment* (*n* = 12,203)
Respondent's age (%)			
18–24	5.9	13.8	5.4
25–34	15.1	37.7	15.9
35–44	16.3	20.7	17.1
45–54	20.2	16.8	20.1
55–64	21.0	6.6	20.8
65 or older	21.5	4.4	20.7
Respondent's education (%)			
High school or less	23.3	18.8	21.3
Some college	33.5	26.2	33.8
College	25.6	33.8	26.2
Postgrad	17.6	21.2	18.7
Male (%)	48.0	59.1	48.3
White (%)	76.8	54.5	76.6
Respondent's (household) income (%)			
Income less than $15,000	5.2	4.5	4.5
At least $15,000 and less than $25,000	7.2	6.4	6.4
At least $25,000 and less than $35,000	9.4	8.6	8.8
At least $35,000 and less than $50,000	14.6	12.9	14.2
At least $50,000 and less than $75,000	22.6	19.4	22.8
At least $75,000 and less than $100,000	15.6	15.6	16.3
At least $100,000 and less than $150,000	15.8	17.7	16.8
$150,000 and greater	9.6	14.9	10.2
Income shock (%)	23.7	39.8	23.6
Difficulty paying bills (%)			
Very difficult	9.5	16.1	9.3
Somewhat difficult	38.0	40.0	38.0
Use of online payment services (%)	81.0	93.7	—
Use of mobile phone for checkout (%)	5.6	—	6.5
Use of high cost credit (%)	16.7	50.2	16.8
Number of credit cards (%)			
1	18.8	16.6	16.7
2–3	41.5	41.7	40.7
4–8	33.8	28.6	36.7
9–12	4.3	6.7	4.7
13–20	1.1	3.2	1.2
More than 20	0.5	3.2	0.06
Credit card use (%)			
Use of cash advance	9.6	31.0	10.0
Minimum payment only	32.6	45.1	33.9
Pay over the limit fees	7.1	26.1	7.5
Carry a balance	49.8	52.3	51.7
Pay late fees	15.1	31.3	16.1
Have bank account (%)	87.8	91.7	88.9
Attitude towards risk	5.0	7.0	5.1
Financial knowledge	3.5	2.8	3.5
Financial confidence	17.4	17.4	17.4
Financial satisfaction	5.7	7.1	5.7

NOTE: All differences in means or percentages between groups who report use of mobile payments or online payments are statistically significant at the .05 level for all variables.

TABLE 2: Logistic Regression to Predict Adoption of Mobile Payment Technology (*N* = 15,060)

Variable	*Estimate*	*Odds*
Respondent's age (Ref: 18–24)		
25–34	−0.1431	0.867
35–44	−0.6637***	0.515
45–54	−0.8127***	0.444
55–64	−1.6805***	0.186
65 or older	−1.9017***	0.149
Respondent's education (Ref: high school or less)		
Some college	−0.1115	0.894
College	0.3232**	1.382
Postgrad	0.2497	1.284
Male	0.3599***	1.433
White	−0.4995***	0.607
Respondent's (household) income (Ref: less than $15,000)		
At least $15,000 and less than $25,000	0.2476	1.281
At least $25,000 and less than $35,000	0.2571	1.293
At least $35,000 and less than $50,000	0.1550	1.168
At least $50,000 and less than $75,000	0.2262	1.254
At least $75,000 and less than $100,000	0.4213	1.524
At least $100,000 and less than $150,000	0.6697**	1.954
$150,000 and greater	0.8644***	2.374
Experienced an income shock	0.3560**	1.428
Attitude towards risk	0.1526***	1.165
Difficulty paying bills (Ref: not at all difficult)		
Very difficult	0.6184***	1.856
Somewhat difficult	0.3159**	1.372
Use of online payment services	1.2921***	3.640
Use of high cost credit	0.9512***	2.589
Financial knowledge	−0.2275***	0.797
Financial confidence	−0.0142	0.986
Financial satisfaction	0.2289***	1.257
Number of credit cards (Ref: 1)		
2–3	0.2215	1.248
4–8	0.2530*	1.288
9–12	0.6287**	1.875
13–20	1.0966***	2.994
More than 20 cards	1.6912***	5.426
Credit card use		
Use of cash advance	0.5352***	1.708
Only make minimum payment	−0.1284	0.880
Pay over the limit fees	0.4948**	1.640
Carry a balance	−0.1331	0.875
Pay late fees	0.0947	1.099
Have a bank account	0.2894*	1.336

NOTE: *<.05, **<.01, ***<.001.

shock in the past year (43%). These factors are suggestive of consumers that are living on the verge of financial difficulty. However, contrary to hypothesis 4, greater likelihood of mobile payment behavior was noted for the highest income categories. Those making between $100,000 and $150,000 were 95% more likely than individuals making less than $15,000 to report a mobile payment, and the effect was greater (137%) for those making more than $150,000.

Hypotheses 5 and 6 dealt with credit card ownership and behavior, with findings being mixed. Hypothesis 5 was supported as the probability of making

mobile payments increased significantly as the number of cards held increased. Those with more than 20 cards were more than four times as likely to report making a mobile payment when compared with those with only one card.

Focusing on credit card use behaviors (H_6), the effects were not consistent. For many of the credit card use variables, no significant differences were noted between those who reported making mobile payments and those who did not. However, for those that were significant, the behavior was consistent with the hypothesis of riskier credit card use behavior for mobile payees. Respondents who reported using credit cards for cash advances were 71% more likely to report making a mobile payment, and those reporting payment of over-the-limit fees were 64% more likely to do so.

Results partially supported Hypothesis 7, as mobile payment users were less knowledgeable, all else being equal. For each additional knowledge question that a respondent answered correctly, the likelihood of mobile payment use declined by 20%. However, assumptions about education level were not supported. Respondents with a college degree were 38% more likely to make a mobile payment compared with those with a high school diploma or less. No other statistically significant differences were noted for education.

Hypothesis 8 was not supported. Those who reported making mobile payments were more satisfied than their counterparts. For each unit increase in self-reported financial satisfaction (scale of 1–10), the likelihood of mobile payments increased by 26%, *ceteris paribus*.

As expected, individuals who had a bank account were 34% more likely to have made a mobile payment (H_9). Hypothesis 10 received partial support. Whereas individuals with more positive risk attitudes were more likely to report mobile banking, the measure of financial confidence was not statistically significant.

IMPLICATIONS

Mobile payment behavior was strongly associated with a number of personal financial characteristics and behaviors. Those who reported making mobile payments were predominantly young, male, educated, minorities with higher than average income levels. As expected, those who utilized online banking to make payments were more likely to report making a mobile payment, *ceteris paribus*. When a person considers the advancements of mobile banking and payment options available, one of the key advantages from a consumer standpoint is convenience. These technologies allow for greater access to information and reduction of transaction costs (often in terms of time). However, it is important to consider whether these instruments offer convenience or whether they are potentially supportive of compulsive spending behavior in some instances.

In many ways, those reporting mobile payment behavior were more likely to be less stable financially. Although these transactions were primarily occurring among respondents with income of $100,000 or more, respondents who reported mobile payments were more likely to have difficulty meeting their monthly obligations, and they engaged in high cost credit transactions, and they displayed riskier credit card behavior. The specific credit card behaviors that are noted as significant for this analysis, payment of over the limit fees and taking cash advances, are suggestive of individuals who could be engaged in impulsive spending or risky debt management.

This association between credit card utilization and technology adoption raises questions about the underlying decision process. Marketing research has suggested that consumers may spend more freely with mobile payments (Alliance, 2008). In effect, mobile payments add a level of separation from currency, and it is easier for consumers to make purchases when they are not required to physically part with cash.

However, it is unclear from this study whether the observed associations are indicative of the early adopters of this technology themselves, or whether consumer behavior is changing based on the technology. As mobile payments become more common in U.S. markets, will consumer spending habits shift to display less responsible spending behavior based on the ease of transactions? This question could not be answered with this data. However, the results should be considered in future research. Despite the widespread use of mobile payments in other countries, little data has been collected on the potential impact of this technology on consumers in the United States.

There were some limitations in the study. First, the data were cross-sectional. It is possible that individuals who are struggling with credit card management or debt are more likely to turn to these new technologies to assist with behavior tracking or management.

Second, the results are limited by the variables that were available. For the mobile payment variable, there is information only on whether or not individuals have made a mobile payment. Future analyses could explore the potential benefits and risks of these new technologies as tools for consumer education. Mobile phones allow for real-time interaction between financial institutions and consumers for debt management and account tracking. This could be an emerging consumer issue because use of these new innovations is likely to grow rapidly.

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