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The Impact of Mobile Financial Services on Visiting a Branch: The case of the United States

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A B S T R A C T

This study uses the data of the 2016 Surveys of Consumers' Use of Mobile Financial Services that were conducted by the US Federal Reserve, to investigate the effects of using mobile financial services on the probability of visiting a branch. A logit model yields the following findings. Firstly, the relationships of mobile banking usage with the probability of visiting a branch is weakly substitutional, and mobile payment usage is irrelevant to this probability. Secondly, the older the survey respondents are, the more likely they visit a branch. Thirdly, mobile payment services provided by nonfinancial institutions have insignificant effects on the probability of using a branch. Our findings contradict the hypothesis about disintermediation in financial technology (FinTech).

Keywords: Mobile financial services, Bank branches, FinTech

JEL classification: G21, G23, O16, O33

1. Introduction

The adoption of new technologies has led to a growing diversity of banking service channels. In 1965, Bank für Sparanlagen und Vermögensbildung AG (BSV) began to serve its customers by telephone in Frankfurt, Germany. In 1967, Barclays launched the first automatic teller machine (ATM) in the world. The Security First Network Bank was founded in 1995 as the world's first online-only bank. The advent of ATMs and voice-based, online, and mobile banking has reshaped the use of banking services, corresponding with the emergence of digital finance. As Brett King (2012), author of *Bank 3.0*, remarks, "banking is no longer somewhere you go, but something you do".

By the turn of the millennium, much empirical research into the effects of new service channels on the operational performance and risks of banks has shown that the provision of online services can reduce financial institutions' operating costs and accordingly improve their performance over time, rather than immediately[1].

Nevertheless, how the diversity of banking services influences the selection of such services has yet to be empirically analyzed. A report on *The Future of Financial Services*, published in 2015 by the World Economic Forum (WEF), predicts that the development of financial technology (FinTech) may induce the disintermediation of traditional financial institutions, and advances in digital financial services such as mobile payment and peer-to-peer lending may equip nonfinancial firms and technology startups to provide financial services, placing them in competition against banks as well as other financial institutions. This paper investigates whether the banks' counter service decreases because of the diversity of new banking service channels and whether FinTech disintermediation occurs accordingly in traditional financial institutions.

The sample data was collected from the 2016 Survey of Consumers' Use of Mobile Financial Services conducted by the Federal Reserve (Fed). The survey quizzed Americans aged 18 and above by email about banking, mobile phone usage, mobile banking users, mobile payment users, non-mobile banking users, non-mobile payment users, mobile financial services security, shopping behavior, and financial management. A sample selection of the US population was obtained by considering income, education level, gender, and residential area of the respondents.

The variables of "mobile banking usage" and "mobile payment usage" in this study are constructed on the basis of the survey responses. A logit regression model is subsequently used to examine the correlation of ATM usage, mobile banking usage, and mobile payment usage with the probability of visiting a branch. Three main findings are as follows.

First, with the variety of banking service channels and respondents' demographic characteristics accounted for, ATM usage has significant positive effects on the probability of visiting a branch, whereas mobile banking usage creates uncertainty with this probability. However, the relationship between mobile banking usage and visiting a branch is significantly negative, according to the analysis of the 2015 survey responses. Moreover, the effect of mobile payment usage on the use of traditional banking services is insignificant. Thus, this empirical finding provides no significant support for FinTech disintermediation, consistent with the related studies. (e.g., Joseph, 2016). Financial services in emerging markets are rapidly developing, prompting the rapid introduction of mobile payment services and producing significant disintermediation effects, whereas developed countries see these payment services

[1] For examples: DeYoung et al. (2007), Hernando and Nieto (2007), Ciciretti et al. (2009).

penetrate less rapidly because the adoption of traditional financial services is already widespread. This finding is validated by controlling for the endogeneity of the variables.

Second, age significantly affects the probability of visiting a branch. Middle-aged and older respondents are more likely to visit a branch, consistent with the findings of Teo, Tan, Cheah, Ooi, and Yew (2012). This age group characteristically has low technology acceptance and is therefore less likely than younger age groups to use mobile financial services.

Finally, trends in the use of banking service channels reveal a weakly substitution relationship between online and offline channels. This contrasts with DeYoung, Lang, and Nolle (2007), Hernando and Nieto (2007), Ciciretti, Hasan, and Zazzara, (2009), and Onay and Ozsoz (2013), who note that the use of mobile banking contributes to reducing banks' operating costs, thereby enhancing their operational performance, and that mobile financial services and branches are therefore complementary. This study finds that increased mobile banking usage is unrelated with visiting a branch. This is supported by the empirical analysis of the 2015 Fed survey of Consumers' Use of Mobile Financial Services that increased mobile banking usage significantly reduces the use of channels. This study finds that increased mobile banking usage is associated with a decreased use of banking insignificantly. However, this negative effect is significant in the analysis from the 2015 Fed survey. Thus, from the perspective of customers' banking channel usage behavior, we infer that a weakly substitution relationship exists between mobile bank channels and branch.

The rest of this paper is organized as follows. Section 2 introduces past studies on mobile financial services and the effects of these services on bank operational performance. Section 3 describes the data source. Section 4 presents the empirical results of logit regression and robustness testing, regarding the effects of various banking services on the probability of visiting a branch. Section 5 provides conclusions and implications.

2. Literature Review

Mobile banking services were introduced in Germany and the United States in the 1990s; since then, such services have been launched in other parts of the world. With continuous development in information and communications technology, banking service channels distinct from channels have increasingly emerged, aided by the emergence of digital finance. Therefore, "banking is no longer somewhere you go, but something you do," argues King (2012).

Mobile banking services, particularly internet banking, have been studied since the 21st century. The mobile banking literature can be broadly categorized into two topics. The first is the adoption of mobile financial services (e.g., Dahlberg, Guo, & Jan Ondrus, 2015; Dennehy & Sammon, 2015; Shaikh & Karjaluoto, 2015), and the theoretical frameworks for this topic can be divided into three categories. The first category is the technology acceptance model (TAM), which is widely used to determine the adoption of mobile banking. Shaikh and Karjaluoto (2015) report that 23 out of 55 mobile banking studies have employed this model as their theoretical base, and identified perceived usefulness and ease of use as the fundamental determinants of mobile banking adoption (e.g., Aboelmaged & Gebba, 2013; Bankole, Bankole, & Brown, 2011; Chitungo & Munongo, 2013; Safeena, Date, Kammani, & Hundewale, 2012). The second category of the framework is the Rogers' diffusion of innovations (1995), which proposes five factors that determine the adoption of an innovation: relative advantage, compatibility, complexity, observability, and trialability (e.g., Kim, Shin, & Lee, 2009; Lin, 2011). The third category is the unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003), which states that factors such as perceived usefulness and

relative advantage affect usage intention (e.g., Luo, Li, Zhang, & Shim, 2010; Tan et al. 2010; Yu, 2012; Zhou, 2012).

The other mobile banking topic concerns the effects of mobile banking on bank operational performance and risks. DeYoung (2005) compares the performance of pure internet and brick-and-mortar (BAM) banks in the United States, showing that internet banks earn lower profits. Using a 1999–2001 sample of American community banks, DeYoung et al. (2007) compare the performance of pure internet and BAM banks to investigate the effects of internet banking adoption on the use of banking. They show that internet and channels are complementary, and that internet banking improves bank profitability by increasing revenues from deposit service charges. Furthermore, internet banking is linked with the shift of deposits from checking accounts to money market deposit accounts, the increased use of brokered deposits, and higher average wages for bank employees.

Hernando and Nieto (2007) use a 1994–2002 sample of over 70 Spanish banks to examine how the adoption of transactional websites influences bank operational performance, and show that using these websites contributes to gradual reductions in operating expenses and staff costs (which become significant 1.5 years after adoption), thereby increasing bank profitability. Thus, they argue that internet banks complement, rather than replace, BAM banks. Ciciretti et al. (2009) employ the 1993–2002 panel data of Italian banks and find that, on the basis of different definitions of internet banking activity, the adoption of internet activities is significantly and positively related to bank profitability but negatively related to bank risk.

3. Data Sources

3.1 Data Selection

Our data was collected from the Consumers and Mobile Financial Services 2016 conducted by the FED. The survey and report were prepared by the Consumer and Community Development Research Section of the Federal Reserve Board's Division of Consumer and Community Affairs (DCCA). In 2011, the DCCA conducted its first Survey of Consumers' Use of Mobile Financial Services (the "Mobile Survey").

The 2016 survey was administered by GfK, an online consumer research company, on behalf of the Board. The survey was conducted in English using a sample of adults ages 18 and over from KnowledgePanel® , a proprietary, probability-based web panel of more than 50,000 individuals from randomly sampled households. The sample was designed to be representative of the U.S. population, including a sample of respondents who had responded to both the 2014 and 2015 surveys, as well as a random sample of new respondents. After pretesting, the data collection for the survey began on November 4, 2015, and concluded on November 23, 2015.

E-mails were sent to 1,364 individuals who had responded to both the 2014 and 2015 surveys and 2,324 randomly selected individuals from the remaining members of KnowledgePanel® .

3.2 Descriptive Statistics and Correlation Tests

Table 1 shows the definitions of the variables and the results of the 2016 FED survey in this study. Except for mobile banking usage and mobile payment usage, the other variables employed in this study were from the results of the 2016 FED survey. Therefore, the mean, minimum, and maximum are all between zero and one. For example, 85.86% of respondents among the 2,687 have visited a branch in the past year (with a standard deviation of 0.3485). A value of one (zero) is assigned to the respondents who have (have never) visited a branch. Similarly, this dummy is used to define and describe the remaining variables and its corresponding descriptive statistics are shown in Table 1.

The mobile banking usage takes the sum of the respondents' items of Question 28 in the 2016 FED survey. The Question 28 investigated the respondents who have used the mobile banking services in the past 12 months. The eight items are: (1) Checked an account balance or checked recent transactions (2) Made a bill payment using your bank's online banking website or banking app (3) Received an alert (e.g., a text message, push notification or email) from your bank (4) Transferred money between your bank accounts (5) Sent money to relatives or friends within the U.S. using your bank's app or mobile website (6) Sent money to relatives or friends outside the U.S. using your bank's app or mobile website (7) Deposited a check to your account electronically using your mobile phone camera (8) Located the closest in-network ATM or branch for your bank. Similarly, the mobile payment usage takes the sum of the respondents' items of Question 34 in the 2016 FED survey. The seven items of Question 34 are: (1) Sent money to relatives or friends within the U.S. (e.g., Venmo, PayPal, Google Wallet, your bank's app) (2) Sent money to relatives or friends outside the U.S. (e.g., Western Union or USPS Sure Money, your bank's app) (3) Paid for something in a store using your mobile phone/app (e.g., Starbucks, Apple Pay) instead of cash or a physical payment card (4) Paid for parking, a taxi, car service (e.g., Uber), or public transit (5) Paid a bill using your mobile phone's web browser or an app (6) Purchased a physical item or digital content remotely by using your mobile phone's web browser or an app (7) Made a donation or other payment using a text message.

In addition, to prevent the correlation of the variables from influencing the empirical validity, a variance inflation factor (VIF) test is performed. The results are summarized in Table 2, which shows that all the VIF values for the variables employed in this study do not exceed 10 and the average VIF value is 2.22, indicating the absence of collinearity in the sample[2].

[2] The correlation coefficients of all the variables range from -0.5940 to 0.6417; thus, no high correlation is exhibited. However, because of word limits, a table of the correlation coefficient matrix is not presented. Please contact authors if this table is required.

Table 1. Definitions of Variables and the Sample Descriptions.

Variable	Definitions	Groups	Have you visited a bank branch and spoken with a teller or a bank employee in the past 12 months?		No. of Observations
			Yes	No	
ATM	Have you used an ATM for any banking transactions in the past 12 months?	Yes	86.31%	13.69%	2111
		No	84.20%	15.80%	576
mobile banking usage	Based on respondents' items of Question 28 in the 2016 FED survey	0	88.30%	11.70%	1185
		1	89.80%	10.20%	353
		2	82.50%	17.50%	280
		3	83.30%	16.70%	270
		4	79.60%	20.40%	260
		5	83.10%	16.90%	183
		6	84.60%	15.40%	91
		7	86.70%	13.30%	45
		8	65.00%	35.00%	20
mobile payment usage	Based on respondents' items of Question 34 in the 2016 FED survey	0	87.70%	12.30%	1891
		1	81.60%	18.40%	348
		2	81.70%	18.30%	219
		3	82.40%	17.60%	142
		4	73.30%	26.70%	45
		5	85.20%	14.80%	27
		6	80.00%	20.00%	10
		7	80.00%	20.00%	5
Metro	Only one category can be selected: The selected category is defined as 1, and otherwise 0.	Metro	85.37%	14.63%	2379
		Non-Metro	89.61%	10.39%	308
Age					
18-29	Only one category can be selected: The selected category is defined as 1, and otherwise 0.	agegrp1	80.79%	19.21%	354
30-44		agegrp2	78.19%	21.81%	596
45-59		agegrp3	87.62%	12.38%	808
60+		agegrp4	91.17%	8.83%	929
Education					
Less than high school	Only one category can be selected: The selected category is defined as 1, and otherwise 0.	lths	82.35%	17.65%	170
High school		hs	86.61%	13.39%	687
Some college		somecoll	85.36%	14.64%	840
Bachelor's degree or higher		coll	86.36%	13.64%	990
Ethnicity					
White, Non-Hispanic	Only one category can be selected: The selected category is defined as 1, and otherwise 0.	white	87.72%	12.28%	1629
Black, Non-Hispanic		black	87.74%	12.26%	424
Other, Non-Hispanic		other	80.45%	19.55%	133
Hispanic		hispanic	79.64%	20.36%	501
Gender					
Female	Only one category can be selected: The selected category is defined as 1, and otherwise 0.	female	86.22%	13.78%	1335
Male		male	85.50%	14.50%	1352
Annual Household Income					
Less than $25,000	Only one category can	incgrp1	86.52%	13.48%	282

Variable	Definitions	Groups	Have you visited a bank branch and spoken with a teller or a bank employee in the past 12 months?		No. of Observations
			Yes	No	
$25,000-$39,999	be selected:	incgrp2	88.06%	11.94%	511
$40,000-$74,999	The selected category is	incgrp3	86.90%	13.10%	435
$75,000-$99,999	defined as	incgrp4	84.12%	15.88%	699
Greater than $100,000	1, and otherwise 0.	incgrp5	85.13%	14.87%	760
Married					
Married	Only one category can	married	85.20%	14.80%	1588
Not married, widowed, divorced, or living with partner	be selected: The selected category is defined as 1, and otherwise 0.	Non_married	86.81%	13.19%	1099
Current Employment Status					
Employed	Only one category can	employed	84.35%	15.65%	1122
Unemployed but in labor force	be selected: The selected category is	un_employed	82.68%	17.32%	127
Not in labor force	defined as 1, and otherwise 0.	nilf	88.64%	11.36%	995

Table 2. Variance Inflation Factor Test Results of the Variables.

Variable	VIF
ATM	1.0890
mobile banking usage	1.9130
mobile payment usage	1.7270
Female	1.0290
Household Members	1.3680
Married	1.4630
Metro	1.0740
Age (Reference Variable: 18-29)	
30-44	2.3620
45-59	2.8770
60+	3.7380
Education (Reference Variable: Less than high school)	
High school	3.9730
Some college	4.4340
Bachelor's degree or higher	5.0680
Current Employment Status (Reference Variable: Unemployed but in labor force)	
Employed	1.6020
Unemployed but in labor force	1.1920
Ethnicity (Reference Variable: White, Non-Hispanic)	
Black, Non-Hispanic	1.2130
Other, Non-Hispanic	1.0660
Hispanic	1.2980
Annual Household Income (Reference Variable: Less than $25,000)	
$25000,- $39,999	2.3910
$40,000 - $74,999	2.3440
$75,000 - $99,999	3.0430
Greater than $100,000	3.5390
Average VIF	2.2200

4. Results and Analysis

4.1 Overview of the Respondents Who Have Visited a Branch

To explore the relationship between visiting a branch and personalities, we employ the following personnel status: age, gender, family members, marital status, education level, residential area, ethnicity, employment, and annual household income to determine which types of respondents have visited branch in the past 12 months.

The survey results shown in Table 1 indicate that over 80% of the respondents have visited a branch in the past 12 months, regardless their demographic characteristics. The number of respondents using service decreases slightly as mobile banking usage increase. This result implies that the effects of mobile banking usage and mobile payment usage on visiting a branch are unclear, which contradicts a claim from some analysts that have been predicting the end of branching as a result of the increasing use of Internet and mobile banking. With the growth of mobile banking services, Cortés (2015) indicates that some debate about the future of physical bank branches and their role in mortgage lending has arisen. Furthermore, less than 80% of Latin Americans aged 30–44 visit a branch. Finally, marked differences in the visiting of branches exist across different age groups: respondents aged 45 or above are significantly more likely to use this service, indicating a general preference among middle-aged and older adults for traditional banking channels.

4.2 Logit regression

Logit regression is used to investigate the relationship among ATM usage, mobile banking usage, mobile payment usage and visiting a branch. The logistic regression model is specified as follows.

$$P\left(D_{branches}=1\right)=F\left(\beta' X\right) \tag{1}$$

where $D_{branches}$ is a dummy variable which takes the value of 1 if a respondent had already visited a branch during the last 12 months, otherwise 0. $F(\cdot)$ is the cumulative probability density function of the logistic distribution. β is the vector of the coefficients and X is the vector of explanatory variables, which includes the ATM usage, mobile banking usage, mobile payment usage, age, gender, household members, marital status, metro, education level, employment status, ethnicity, and annual household income.

The logistic regression results are presented in Table 3 under two different models. Model 1 in Table 3 analyzes how respondents' demographic characteristics influence their branched using, but exclude the ATM usage, mobile banking usage, and mobile payment usage. The empirical result indicates that age, marital status, and household members significantly affect visiting a branch. Married and Hispanic are less likely to visit. Notably, a higher probability of visiting a branch is observed among respondents aged 45 or above, and with larger household members. For example, most respondents visiting a branch in the past 12 months are aged 60 or above, followed by those aged 45–59 years. Moreover, the odds ratio (OR) for the likelihood of visiting a branch for respondents aged 60 or above is 3.1503 times that for those aged 18–29 years, and 2.0842 times that for those aged 45–59 years. This finding is consistent with that of Teo et al. (2012) but not with that of Crabbe, Standing, Standing, and Karjaluoto (2009) and Laukkanen and Cruz (2012). Laukkanen and Cruz (2012) find higher acceptance of mobile banking among male individuals in Bulgaria and Finland. Crabbe et al. (2009) integrated the TAM with the demographic characteristics of their Ghanaian subjects, suggesting that gender,

age, education level, employment status, and annual household income affects the subjects' perceived practicality, ease of use, and reliability of mobile banking and, in turn, their acceptance of it.

Table 3. Logit Regression Analysis of Visiting a Branch and Other Banking Service Channels.

	Model 1			Model 2		
Variables	Coefficient	P value	odds ratio	Coefficient	P value	odds ratio
Constant	1.3485	0.0005***		1.1562	0.0036***	
ATM				0.4037	0.0040 ***	1.4974
mobile banking usage				-0.0294	0.4189	0.9710
mobile payment usage				-0.0366	0.5305	0.9640
Female	0.0551	0.6300	1.0567	0.0595	0.6037	1.0613
Household Members	0.0927	0.0406**	1.0971	0.0904	0.0462**	1.0946
Married	-0.3729	0.0078***	0.6887	-0.3532	0.0122 **	0.7024
Metro	-0.2820	0.1637	0.7542	-0.2803	0.1676	0.7556
Age (Reference Variable: 18-29)						
30-44	0.0169	0.9263	1.0171	-0.0045	0.9804	0.9955
45-59	0.7344	0.0001***	2.0842	0.6914	0.0004 ***	1.9966
60+	1.1475	0.0000***	3.1503	1.1144	0.0000***	3.0478
Education (Reference Variable: Less than high school)						
High school	0.2534	0.2930	1.2884	0.2506	0.2995	1.2849
Some college	0.2090	0.3801	1.2324	0.2089	0.3811	1.2324
Bachelor's degree or higher	0.3871	0.1166	1.4727	0.3763	0.1282	1.4569
Current Employment Status (Reference Variable: Unemployed but in labor force)						
Employed	0.0516	0.7272	1.0530	0.0491	0.7418	1.0503
Unemployed but in labor force	-0.0483	0.8593	0.9529	-0.054	0.8433	0.9474
Ethnicity (Reference Variable: White, Non-Hispanic)						
Black, Non-Hispanic	0.0031	0.9857	1.0031	-0.0036	0.9837	0.9964
Other, Non-Hispanic	-0.4301	0.0706*	0.6505	-0.4089	0.0871*	0.6644
Hispanic	-0.4303	0.0033***	0.6503	-0.4288	0.0041***	0.6513
Annual Household Income (Reference Variable: Less than $25,000)						
$25,000 - $39,999	0.1357	0.5557	1.1454	0.1167	0.6133	1.1238
$40,000 - $74,999	-0.0013	0.9958	0.9987	-0.0300	0.9001	0.9704
$75,000 - $99,999	-0.1936	0.3878	0.8240	-0.2015	0.3699	0.8175
Greater than $100,000	-0.1734	0.4618	0.8408	-0.1916	0.4176	0.8256
Observations	2687			2687		
Pseudo R^2	0.0411			0.0454		
Adjust R^2	0.0229			0.0244		

The dependent variable of this table is a branch visiting. See Table 1 for a definition of our variables. All estimations are done using logit regression. In each model, first column presents the estimated coefficients, second is the p value, and the third column gives the odds ratio. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

The relationships among ATM usage, mobile banking usage, mobile payment usage and visiting a bank branch are also examined. Model 2 in Table 3 includes ATM usage, mobile banking usage, and mobile payment usage in a logit regression, showing that even when demographic characteristics are controlled, the use of ATMs in the past 12 months has a significant positive effect on the probability of visiting a branch. The effects of mobile banking usage and mobile payment usage are insignificant. The OR results from Model 2 suggest that this probability increases by 49.74% among respondents who used ATMs in the past 12 months.

When ATM usage, mobile banking usage, and mobile payment usage are accounted, age, marital status, ethnicity, and household members are also found to affect visiting a branch, although their effect size decreases.

4.3 Robustness Tests: Exploring the Endogenous Problem

The endogeneity of variables in the results of the present study are tested on the basis of Newey (1987). This robustness test is conducted by an OLS first stage and Probit second stage. Van Rooij, Lusardi and Alessie (2011a, 2011b) and Hsiao and Tsai (2018) also used this method to verify the robustness. "Mobile banking usage" was selected as an instrumental variable to test the endogeneity of variables in the following steps:

(A) Because Table 4 shows a significant positive relationship between the mobile banking usage and the mobile payment usage, whereas Models 2 in Table 3 presents no significant relationship between the mobile banking usage and visiting branch in the past 12 months, the mobile banking usage is selected as the instrumental variable.

Table 4. First Stage OLS of the IV Regression.

Variables	Coefficient	P value
Constant	0.0051	0.9662
ATM	-0.0031	0.9431
mobile banking usage	0.3428	0.0000***
Female	-0.0034	0.9219
Household Members	-0.0050	0.7175
Married	0.0146	0.7240
Metro	0.0548	0.3151
Age (Reference Variable: 18-29)		
30-44	0.0408	0.5127
45-59	-0.1240	0.0465**
60+	-0.0860	0.2095
Education (Reference Variable: Less than high school)		
High school	-0.0352	0.6477
Some college	0.0249	0.7452
Bachelor's degree or higher	0.1184	0.1328
Current Employment Status (Reference Variable: Unemployed but in labor force)		
Employed	0.0205	0.6347
Unemployed but in labor force	0.0423	0.6259
Ethnicity (Reference Variable: White, Non-Hispanic)		
Black, Non-Hispanic	0.0675	0.1806
Other, Non-Hispanic	0.1109	0.1645
Hispanic	0.1069	0.0275**
Annual Household Income (Reference Variable: Less than $25,000)		
$25000,- $39,999	-0.0747	0.2611
$40,000 - $74,999	-0.1314	0.0607*
$75,000 - $99,999	-0.0955	0.1544
Greater than $100,000	-0.0523	0.4575
Observations	2687	
Pseudo R2	0.4211	
Adjust R2	0.4165	

The dependent variable is mobile payment usage. See Table 1 for a definition of our variables. All estimations are done using OLS. The first column presents the estimated coefficients and the second is the p value. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

(B) This instrumental variable is used to determine whether respondents used mobile payment in the past 12 months.

(C) On the basis of the results on the mobile payment usage in the past 12 months, a probit regression is conducted on customers' visit to a branch in the past year. This controls the endogeneity of both variables.

Table 5 summarizes the results of the preceding test. The instrumental variable estimation shows that the mobile payment usage still has insignificant effects on the probability of visiting a branch and ATM, age, and household members correlates positively with this probability. As such, empirical results from Table 5 validate those from the original logit model regarding the relationship between mobile payment usage and the probability of visiting a branch (Table 3) and indicate no endogeneity.

Table 5. Instrument variables Regression Analysis of Visiting a Branch and Other Banking Service Channels.

Variables	Coefficient	P value
Constant	0.7163	0.0009***
ATM	0.2128	0.0058***
mobile payment usage (Estimated)	-0.0683	0.1509
Female	0.0384	0.5383
Household Members	0.0488	0.0495**
Married	-0.1880	0.0142**
Metro	-0.1429	0.1785
Age (Reference Variable: 18-29)		
30-44	-0.0130	0.9003
45-59	0.3674	0.0008***
60+	0.5862	0.0000***
Education (Reference Variable: Less than high school)		
High school	0.1445	0.2803
Some college	0.1205	0.3641
Bachelor's degree or higher	0.2221	0.1055
Current Employment Status (Reference Variable: Unemployed but in labor force)		
Employed	0.0197	0.8072
Unemployed but in labor force	-0.0317	0.8341
Ethnicity (Reference Variable: White, Non-Hispanic)		
Black, Non-Hispanic	-0.0039	0.9669
Other, Non-Hispanic	-0.2480	0.0628*
Hispanic	-0.2390	0.0043***
Annual Household Income (Reference Variable: Less than $25,000)		
$25000,- $39,999	0.0561	0.6510
$40,000 - $74,999	-0.0129	0.9206
$75,000 - $99,999	-0.1165	0.3385
Greater than $100,000	-0.1041	0.4179
Observations	2687	
Pseudo R^2	0.0456	
Adjust R^2	0.0255	

The dependent variable of this table is a branch visiting. See Table 1 for a definition of our variables. All estimations are done using probit regression. The first column presents the estimated coefficients, and the second is the p value. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

5. Conclusions and Implications

This study discusses the effects of ATMs, mobile banking, and mobile payment on the

probability of visiting a branch, based on data collected from the 2016 Fed Surveys of Consumers' Use of Mobile Financial Services. Our empirical analyses suggest that ATM and mobile banking usage is negative with the use of such services insignificantly. Thus, there exists a weakly substitution relationship between online and offline banking service channels, compared to previous studies that argue that online banking helps reduce operating costs and therefore complements bank branch.

Mobile banking usage has insignificant effects on the branch visiting, indicating no noticeable FinTech disintermediation in the survey results used in this study because the survey respondents reside in the United States, a developed country. Moreover, the mobile payment penetration has been concentrated in emerging markets as of the first half of 2016, which is consistent with the statistics of Joseph (2016).

Age has significant positive effects on the branch visiting. Therefore, both factors, as well as different banking service channels, should be taken into consideration when it comes to establishing and sustaining traditional branches.

Table 6. Logit Regression Analysis of Visiting a Branch and Other Banking Service Channels in the 2015 FED Survey.

Variable	Coefficient	P value	odds ration
Constant	1.1413	0.0065***	
ATM	0.1932	0.2046	1.2132
mobile banking usage	-0.0977	0.0068***	0.9069
mobile payment usage	0.0153	0.7652	1.0154
Female	0.2721	0.0291**	1.3127
Household Members	0.0045	0.9317	1.0045
Married	0.0806	0.5811	1.0840
Metro	-0.1976	0.1641	0.8207
Age (Reference Variable: 18-29)			
30-44	-0.1358	0.4857	0.8730
45-59	0.6734	0.0012***	1.9609
60+	1.1553	0.0000***	3.1749
Education (Reference Variable: Less than high school)			
High school	0.4220	0.1550	1.5250
Some college	0.6835	0.0199 **	1.9809
Bachelor's degree or higher	0.6271	0.0352 **	1.8722
Current Employment Status (Reference Variable: Unemployed but in labor force)			
Employed	0.5561	0.0005***	1.7439
Unemployed but in labor force	0.2670	0.3972	1.3060
Ethnicity (Reference Variable: White, Non-Hispanic)			
Black, Non-Hispanic	-0.3143	0.1816	0.7303
Other, Non-Hispanic	-0.0101	0.9672	0.9899
Hispanic	-0.0246	0.9182	0.9757
Annual Household Income (Reference Variable: Less than $25,000)			
$25000,- $39,999	-0.5714	0.0122**	0.5647
$40,000 - $74,999	-0.1252	0.6011	0.8823
$75,000 - $99,999	-0.3000	0.1893	0.7408
Greater than $100,000	-0.4090	0.0880*	0.6643
Sample Size	3395		
Pseudo R^2	0.0538		
Adjust R^2	0.0314		

The dependent variable of this table is a branch visiting in the 2015 FED Survey. All estimations are done using logit regression. The first column presents the estimated coefficients, the second is the p value, and the third column gives the odds ratio. ***, **, and * indicate statistical significance at the 1%, 5%, and 10%, respectively.

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