# Factors Associated With Electronic Banking Adoption

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*Using data from the 2016 Survey of Consumer Finances, this study investigates factors that affect electronic banking adoption rates. Financial knowledge, income, education, and credit card ownership are associated with a high probability of electronic banking adoption. However, age is negatively associated with the probability of online banking adoption and the African American consumer is less likely to adopt electronic banking. This result is more prominent for African American women but does not hold for African American business owners. Financial counselors, planners, and educators should be aware and sensitive to these differences in order to provide additional education as needed on how to effectively use electronic banking services in order to achieve a greater degree of financial inclusion.*

*Keywords: banking, electronic banking, electronic funds transfer*

Electronic banking, or electronic funds transfer (EFT), allows consumers to access deposited funds via computerized technology. Common EFT services include automated teller machines (ATMs), direct deposit, pay-by-phone systems, personal computer banking, debit cards, and electronic check conversion. As described by Cronin (1998) this technology evolved from the home banking services offered by major banks in the 1980s using the videotext system. With this system, customers used a dial-up service to maintain electronic checkbook registers, see account activity, transfer funds, and make electronic payments to merchants. However, many of these early systems failed because not enough customers adopted the technology to offset the development and maintenance cost. As Internet usage surged in the 1990s, banks took a second look at electronic banking as a way to take advantage of the new trend in order to reduce costs while potentially reaching more customers. Still, customer adoption rates lagged behind bank offering rates. The 2016 Federal Reserve Payments Study (2016) specifically studied mobile phone usage in over 1,000 consumers. They found that 44% of respondent's did not use banking apps in 2016. The 2016 Consumers and Mobile Financial Services Report (2016) also studied mobile banking. They found that 43% of mobile phone users with a bank account reported that they used mobile banking. However, compared to other means of accessing banking services, all forms of electronic banking (ATMs, online banking, mobile banking, and telephone banking) lagged behind visiting a bank branch. Further, the study finds that this result intensifies with age. That is, adoption rates are lower for older consumers than younger consumers even as overall adoption rates increase over time.

Electronic banking adoption is important because many financial institutions are moving away from traditional bank branch offerings and focusing more on electronic means of customer interaction. This move is not only cost effective, but it also allows banks to more efficiently reach a wider target audience. Thus, if most consumers prefer to conduct bank business at a branch, what happens when banks begin closing branches in order to drive customers to electronic delivery modes? There is potential for an increase in the unbanked population as well as a shift from major banks to smaller, service-oriented financial institutions. In order to prevent these potentially negative outcomes, financial institutions aiming to shift their focus to electronic banking, must understand the factors that limit adoption and address those factors in order to meet the needs of their customer base.

The purpose of this study is to identify factors that explain electronic banking adoption rates. Using data from the 2016 Survey of Consumer Finances (SCF), this study estimates

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http://dx.doi.org/10.1891/JFCP-18-00079

the probability of a consumer to use online banking. Specifically, this study estimates the likelihood for direct deposit and electronic bill payment. This study finds that an increase in financial knowledge, income, education, and the number of credit cards, increases the predicted probability of online banking adoption. Conversely, this study finds that an increase in age decreases the predicted probability of online banking adoption. This probability is lowest for individuals in the 80–89 age group. In addition, the study finds that African Americans have a decreased predicted probability of online banking adoption. This result does not hold, however, for African American business owners. This study contributes to the existing literature by providing a closer look at the demographics of those who engage in electronic banking compared to those who do not.

The following section reviews the literature in electronic banking with respect to adoption rates. Next, we describe the 2016 SCF data and the methodology used to address the primary research question: what consumer characteristics drive the differences in electronic banking adoption rates? The next section presents the results of that analysis and the remaining section concludes with arguments for policy implications and future research.

## Literature Review and Hypothesis Development

### *Literature Review*

The electronic banking literature has revealed several industry trends with regard to adoption factors. Common themes include perceptions regarding convenience, ease of use, usefulness, quality, and value. The literature is mixed on whether or not attitudes or perceived benefits impact electronic banking adoption. However, there is little evidence regarding the impact of these issues across demographic groups.

Servon and Kaestner (2008) analyzed an intervention aimed at providing low- and moderate-income individuals in inner-city neighborhoods with financial literacy and Internet usage training. They found few significant quantitative results, but did observe that these individuals expressed an interest in becoming financially and technologically literate. Cai, Yang, and Cude (2008) found that consumers' perceptions of the advantages and problems related to electronic banking had different impacts on their attitudes and use. In other words, they found that perceived problems shape consumer attitudes but perceived advantages have the greatest impact on consumer adoption. Haytko and Simmers (2009) tested the differences in levels of overall consumer satisfaction with banking services based on the type of interaction. They found that in a sample of college students, the convenience of online banking outweighed the importance of human interaction. While many studies find that electronic banking adoption experience to be a positive factor in online banking use, Singer, Baradwaj, Flaherty, and Rugemer (2012) find the opposite result due to its negative impact on perceived ease of use and perceived usefulness. Mehmood, Shah, Azhar, and Rasheed (2014) find four factors that affect electronic banking usage. These are perceived usefulness, privacy and security, web design, and trust. Unyathanakorn and Rompho (2014) find evidence that several factors affect customer satisfaction with electronic banking. Those factors include perceived quality, perceived value, and customer loyalty. Bapat (2017) finds a link between perceived ease of use and satisfaction, which in turn, leads to customer loyalty.

Outside the United States, factors that affect electronic banking adoption are similar to those identified within the United States. Yuen, Yeow, Lim, and Saylani (2010) studied the factors affecting consumer acceptance of electronic banking in developed versus developing nations. They found that in both developed and developing nations, consumer attitude toward using electronic banking is the most important factor affecting consumer acceptance. However, they found that perceived credibility of electronic banking is only a factor in developed countries. Maduku (2013) finds that perceived usefulness, perceived ease of use, and trust have significant positive relationships with attitude in South African bank customers. In Pakistan, Premalatha (2016) examines non-users in India and finds that these consumers do not see the benefits of electronic banking and are content with traditional banking.

Bapat (2019) surveyed postgraduate students in India and found evidence that financial knowledge, help-seeking behavior, and electronic banking precede positive financial management behavior. Li, Hanna, and Kim (2020) use data from the 2015 National Financial Capability Study to focus specifically on mobile payment adoption. They find that 24% of respondents use mobile payments and that the adoption rate for respondents under 25 is 11 times the adoption rate of respondents over 65. Banking and young people is

also a theme in Prevett, Pampaka, Farnsworth, Kalambouka, and Shi (in press) as they present self-efficacy measures of financial literacy validated on 16- to 19-year-old youths in Britain. The authors argue the importance of practical applications as well as classroom knowledge relative to personal finance.

This review of the electronic banking literature suggests that problems and other negative experiences tend to shape consumers' attitudes toward electronic banking but the positive aspects affect adoption. These factors include usefulness, convenience, security, design, trust, quality, and value. These factors influence electronic banking adoption rates, customer satisfaction, and customer loyalty. Consumers outside of the United States cite similar factors influencing electronic banking adoption but place less weight on quality and credibility. To date, much of the research regarding electronic banking has identified differences across demographic groups only anecdotally. This study attempts to gain a deeper understanding of these differences.

### *Hypothesis Development*

This study hypothesizes that electronic banking usage is a function of financial knowledge after controlling for demographic factors. That is, the primary hypothesis of this article is that the likelihood that consumers will use electronic banking increases with financial knowledge. This study measures financial knowledge as self-reported financial knowledge and based on the respondent's accuracy when answering specific financial questions. Specifically, this study tests the following hypotheses:

> **H1:** Online banking usage is positively related to financial knowledge.

Because the literature finds evidence that lower income individuals have limited access to technology and are less technologically literate than those with higher income, we hypothesize that online banking adoption increases with income as noted in $H_2$.

Further, as noted by Lusardi and Mitchell (2007) and others, there is evidence that financial savviness increases with income, education, and majority group membership. Hypotheses 2–4 reflect these correlations.

> **H2:** Online banking usage is positively related to income.
> **H3:** Online banking usage is positively related to education.
> **H4:** Online banking usage is negatively related to race/ethnicity.

The U.S. Consumer Payment study found that mobile banking adoption rates are lower for older consumers than younger consumers are. Our final hypothesis suggests that this result is also applicable to online banking.

> **H5:** Online banking usage is negatively related to age.

## Methodology

### *Data*

This study uses data from the 2016 SCF to explore differences in attitudes toward electronic banking across demographic groups. The National Opinion Research Center(NORC) at the University of Chicago conducts the SCF every 3 years as a cross-sectional survey of U.S. families. As pointed out by Lindamood, Hanna, and Bi (2007) and others, the SCF presents methodological challenges because the dataset contains five implicates or versions of over 6,000 households giving it the appearance of a dataset with a sample size of over 30,000. The Federal Reserve omits some data in the publicly available files in order to protect respondent privacy. Before releasing the data, the Federal Reserve imputes replacement values for this missing data which results in the five implicates. In order to account for the uncertainty caused by these omissions, researchers must combine the five implicates. We address this issue using a weighted sample using a bootstrapping technique outlined by Nielsen (2015). Table 1 presents summary statistics for the dataset.

### *Variables*

The dependent variables are three binary variables that indicate whether the respondent uses online banking. These are *OnlineBanking, DirectDeposit*, and *AutoBillPay*. For all three of these variables, a value of 1 indicates that the respondent answered affirmatively and 0 indicates that the respondent answered negatively. *OnlineBanking* reflects the respondent's answer to the following question: "Have you (or anyone your family living here) used online banking in the past 12 months?" Sevnty-five percent of the respondents

**TABLE 1. Descriptive Statistics of the Weighted Sample**

| Variable | Observations | Mean | Standard Error | Minimum | Maximum |
|---|---|---|---|---|---|
| *#CreditCards* | 6,248 | 1.9018 | 0.0250 | 0 | 10 |
| *Age* | 6,248 | 51.6798 | 0.2198 | 18 | 95 |
| *EducationLevel* (in years) | 6,248 | 9.5345 | 0.0352 | −1 | 14 |
| *FinLit* (# correct) | 6,248 | 1.4696 | 0.0089 | 0 | 3 |
| *FinLit%* | 6,248 | 0.4899 | 0.0030 | 0 | 1 |
| *Income* (in dollars) | 6,248 | 60,828.97 | 2,955.239 | 0 | 9,290,000 |
| *Knowledge* (self-reported) | 6,248 | 7.2547 | 0.0282 | −1 | 10 |

report using online banking in the past 12 months. *DirectDeposit* reflects the respondent's answer to the following question: "Do you have any money automatically deposited directly into your account?" Eighty-four percent of respondents report using direct deposit. *AutoBillPay* reflects the respondent's answer to the following question: "Do you (or anyone in your family living here) make any regular payments automatically?" Sixty-eight percent of respondents report using electronic bill payment.

The variables of interest are four variables that measure financial knowledge. These are *Knowledge, StockRisk, InterestRates*, and *Inflation. Knowledge* reflects respondents' self-reported level of financial knowledge on a scale of −1 to 10 where −1 indicates that the respondent reports that he is not at all knowledgeable and +10 indicates that the respondent reports that he is very knowledgeable. *StockRisk* reflects the respondents' answer to the following question: "Do you think that the following statement is true or false: buying a single company's stock usually provides a safer return than a stock mutual fund?" *InterestRates* reflects the respondents' answer to the following question: "Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, or less than $102?" *Inflation* reflects the respondents' answer to the following question: "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than today, exactly the same as today, or less than today with the money in this account?" From the *StockRisk, InterestRates*, and *Inflation* variables, we create a fifth variable, *FinLit*, which is an aggregate measure of the respondent's financial literacy based on the responses to the three financial literacy questions. For the *StockRisk, InterestRates*, and *Inflation* variables, a value of 1 indicates that the respondent answered correctly and a value of 0 indicates that the respondent did not answer, did not know the correct answer, or answered incorrectly. The *FinLit* variable is the sum of the values for *StockRisk, InterestRates*, and *Inflation* thereby indicating the total number of correct answers. *FinLit%* converts the *FinLit* variable to a percentage. The mean for the *Knowledge* variable is 7.2547 with a maximum value of 10. The mean for the *FinLit%* variable is 0.4899. This disparity between self-reported and tested financial literacy indicates some degree of overconfidence in the respondent's perceived financial knowledge.

The control variables measure various demographic characteristics of the respondents. These variables are *Income, Age, EducationLevel, Race*, and *Male. Income* reflects the respondent's answer to the following question: "In total, what was your (family's) annual income from wages and salaries in 2015, before deductions for taxes and anything else?" The mean value for this variable is $60,828.97. *Age* is the age of the respondent when completing the survey. Survey respondents range in age from 18 to 95 with a mean age of 52. *EducationLevel* reflects the respondent's answer to the following question: "What is the highest level of school completed or the highest degree you have received?" Values for *EducationLevel* range from −1 to 15 where −1 indicates that the respondent completed less than first grade and 15 indicates that the respondent completed a doctorate degree. The mean value for this variable is 9.5345 indicating that the average respondent has an associate degree. *Race* is a vector of race variables corresponding to various possible responses to the question "Which of these categories do you feel best describe you: White, Black or African American, Hispanic or Latino, Asian, American Indian or Alaska Native, Hawaiian Native or other Pacific Islander, or another race?" All respondents describe themselves as either White, Black, Hispanic, or Other with 72% describing

themselves as White. *Male* is a binary variable that is set to 1 if a respondent indicates that he is male and 0 otherwise. Seventy-seven percent of the respondents are male.

***Data Analyses***

To test these hypotheses, we estimate a Probit model as follows:%

$$Pr\,(ElectronicBankingUsage = 1|X) \tag{1}$$

Where $X$ is a vector of regressors found in the literature to influence electronic banking adoption.

## Results

We estimate the probit regression using three different dependent variables and two different key variables of interest resulting in six different model specifications. Table 2 presents the results using all three dependent variables. We test H1 regarding the relation between electronic banking adoption and financial knowledge using two different measures of financial knowledge. Panel A uses *Knowledge* as the key variable of interest. Panel B uses *FinLit%* as the key variable of interest. All models test hypotheses two through five regarding income, education, race, and age respectively. Therefore, all models include *LnIncome, LnAge, EducationLevel, Female, Black, #CreditCards*, and *BusinessOwner* as control variables.

We find evidence that all of our regressors provide significant explanatory power over the probability of electronic banking adoption in at least one model specification.

With regard to our specific hypotheses, we find support for all five hypotheses. In nearly all specifications, electronic banking adoption increases with financial knowledge, income, and education and decreases with age and for non-Whites. The only exceptions are when we measure electronic banking as the use of direct deposit. Here, we find evidence that electronic banking adoption increases with age. This may be due to the increasing rate at which employers are requiring employees to use direct deposit.

Recalling the descriptive statistics for the sample, the average respondent has average financial knowledge, an annual income of $60,828.97, is age 52, owns two credit cards, has earned an Associate's degree, is White, and is male.

Using a model specification that relates specifically to this average respondent, we obtain parameter estimates that result in the following predicted probability of online banking adoption:

$$F\begin{pmatrix} -2.0304 + Knowledge \times 0.4618 + LnIncome \times 0.1153 \\ +AgeSq \times -0.0003 + \#CreditCards \\ \times 0.1913 + EducationLevel \times 0.1509 + Male \times 0.2188 \\ +White \times 0.2264 \end{pmatrix} \tag{2}$$

Substituting the values for the average respondent, gives:

$$F\begin{pmatrix} -2.0304 + 7.2547 \times 0.4618 + 11.02 \times 0.1153 \\ +2,670.80 \times -0.0003 \\ +1.9018 \times 0.1913 + 9.5345 \times 0.1509 + 1 \times 0.2188 \\ +1 \times 0.2264 \end{pmatrix} \tag{3}$$

Therefore:

$$F\,(4.03) \tag{4}$$

Using the normal function, the predicted probability of electronic banking adoption for the average survey respondent is 99.9972%.

We expect that certain factors have a negative impact on electronic banking adoption rates. Namely, as pointed out in hypotheses 4 and 5, these are race and age. Therefore, we estimate the probability of electronic banking adoption for an 83-year-old Black man as compared to the 53-year-old White man who is the typical respondent in the study. In this case, the predicted probability of online banking adoption changes to:

$$F\begin{pmatrix} -1.853 + Knowledge \times 0.0488 + LnIncome \times 0.1134 \\ +AgeSq \times -0.0003 + \#CreditCards \\ \times 0.1881 + EducationLevel \times 0.1559 + Male \times 0.1863 \\ +Black \times -0.3874 \end{pmatrix} \tag{5}$$

Substituting the values for an 83-year-old Black male respondent holding all other demographics constant gives:

$$F\begin{pmatrix} -1.853 + 7.2547 \times 0.0488 + 11.02 \times 0.1134 + 6,889 \\ \times -0.0003 + 1.9018 \times 0.1881 \\ +9.5345 \times 0.1559 + 1 \times 0.1863 + 1 \times -0.3874 \end{pmatrix} \tag{6}$$

**TABLE 2. Probability of Electronic Banking Adoption**

| Panel A: Knowledge | | | |
|---|---|---|---|
| **Variable** | ***Y = OnlineBanking*** | ***Y = DirectDeposit*** | ***Y = AutoBillPay*** |
| *Knowledge* | 0.4709 (5.35)[c] | 0.0359 (4.05)[c] | 0.0283 (3.67)[c] |
| *LnIncome* | 0.1130 (8.06)[c] | 0.1340 (9.27)[c] | 0.1036 (7.57)[c] |
| *AgeSq* | –0.0003 (–27.49)[c] | 0.0001 (10.83)[c] | –0.0000 (–5.09)[c] |
| *EducationLevel* | 0.1542 (19.36)[c] | 0.0936 (11.95)[c] | 0.0634 (9.47)[c] |
| *Female* | –0.1643 (–3.67)[c] | 0.0023 (0.05) | –0.0644 (–1.63) |
| *Black* | –0.3818 (–7.33)[c] | –0.0342 (–0.63) | –0.1057 (–2.27)[b] |
| *#CreditCards* | 0.1829 (13.59)[c] | 0.0773 (5.96)[c] | 0.1041 (10.10)[c] |
| *BusinessOwner* | 0.3105 (4.51)[c] | –0.4691 (–7.69)[c] | 0.0994 (1.84)[c] |
| *Constant* | –1.6492 (–10.13) [c] | –1.9380 (–11.59)[c] | –1.5403 (–10.04) [c] |
| *Pseudo $R^2$* | 0.3019 | 0.1178 | 0.0794 |
| *N* | 6,248 | 6,248 | 6,248 |
| **Panel B: FinLit%** | | | |
| **Variable** | ***Y = OnlineBanking*** | ***Y = DirectDeposit*** | ***Y = AutoBillPay*** |
| *FinLit%* | 0.4267 (5.98)[c] | 0.1885 (2.56)[c] | 0.1647 (2.65)[c] |
| *LnIncome* | 0.1143 (8.13)[c] | 0.1356 (9.40)[c] | 0.1045 (7.64)[c] |
| *AgeSq* | –0.0003 (–27.46) [c] | 0.0001 (11.01)[c] | –0.0000 (–4.92)[c] |
| *EducationLevel* | 0.1501 (18.66)[c] | 0.0944 (11.94)[c] | 0.0626 (9.21)[c] |
| *Female* | –0.1464 (–3.25)[c] | 0.0059 (0.12) | –0.0594 (–1.49) |
| *Black* | –0.3628 (–6.98)[c] | –0.0208 (–0.38) | –0.0959 (–2.06)[b] |
| *#CreditCards* | 0.1819 (13.50)[c] | 0.0783 (6.03)[c] | 0.1044 (10.11)[c] |
| *BusinessOwner* | 0.3100 (4.50)[c] | –0.4635 (–7.61)[c] | 0.1034 (1.91)[a] |
| *Constant* | –1.5948 (–9.98)[c] | –1.8504 (–11.24)[c] | –1.4653 (–9.73)[c] |
| *Pseudo $R^2$* | 0.3028 | 0.1160 | 0.0786 |
| *N* | 6,248 | 6,248 | 6,248 |

***Note.*** This table presents the results of various probit model specifications. Regression coefficients are presented with *z*-scores in parentheses.
[a]Indicates significance at the 10% level. [b]Indicates significance at the 5% level. [c]Indicates significance at the 1% level.

Therefore:

$$F(-0.67) \quad (7)$$

By changing the consumer from a 53-year-old White male to an 83-year-old Black male, the predicted probability of online banking adoption decreases from 99.9972% to 25.1429%.

We are most interested in those factors that are associated with a decreased probability of electronic banking adoption. Those are *AgeSq, Female, Black*, and *BusinessOwner*. First, we examine the impact of age on the probability of electronic banking adoption. We subdivide the data into 10-year age groups. Then, using Model 1, we predict the probability of electronic banking adoption at each age group. Table 3 presents the results of that estimation.

Our results show a steady decline in predicted adoption probability with age with the exception of the 195 respondents over the age of 89.

Next, we consider interactions between explanatory variables. That is, given that older people, African Americans, women, and business owners appear to be less inclined to adopt electronic banking technology, we test the probability that an individual exhibiting two of these characteristics

**TABLE 3. Predicted Probability of Online Banking Adoption by Age Group**

| Age Group | Frequency | Adoption Probability |
|---|---|---|
| 18–19 | 75 (0.24%) | 0.9913 |
| 20–29 | 2,735 (8.75%) | 0.9534 |
| 30–39 | 4,665 (14.93%) | 0.9396 |
| 40–49 | 5,555 (17.78%) | 0.9232 |
| 50–59 | 7,005 (22.42%) | 0.8551 |
| 60–69 | 6,400 (20.49%) | 0.7976 |
| 70–79 | 3,180 (10.18%) | 0.6398 |
| 80–89 | 1,430 (4.58%) | 0.5381 |
| 90–95 | 195 (0.62%) | 0.7577 |
| Total | 31,240 (100%) | |

***Note.*** This table presents the number of observations in each age group and the predicted probabilities for online banking adoption by age group.

would adopt electronic banking technology. First, we test the interactions between the various age groups and the variables *Black, Female*, and *BusinessOwner*. We find negative coefficients the age group variables beginning with the 30 to 39 age group. This effect increases when interacted with *Black* and *Female* as evidenced by higher *z*-scores. However, when age group is interacted with *BusinessOwner*, the *z*-score decreases or the coefficient becomes insignificant.

We test three additional combinations and present the results in Table 5.

In every specification, we find a negative and significant coefficient for both *Black* and *Female* and a positive and significant coefficient for *BusinessOwner*. However, the only interaction term that is significant is *Female* × *BusinessOwner* when measuring financial literacy with the subjective *Knowledge* variable. When using *FinLit%* as the financial literacy measure, both *Black* × *BusinessOwner* and *Female* × *BusinessOwner* are positive and significant.

## Discussion

We identify factors that affect electronic banking adoption using data from the 2016 SCF. We find evidence of several factors that affect the probability of electronic banking adoption. Positive factors include financial knowledge, income, education, and credit card ownership. Negative factors include age, gender, race, and business ownership. We further investigate the negative factors. We find that the probability of online banking adoption decreases with age and that this result is more dramatic for African Americans and women. However, we find that this result is less dramatic for business owners. We find that African American business ownership is not a significant factor that can explain online banking use. However, we find that female business ownership is. We argue that these findings support the literature that links electronic banking and trust. Our findings, similar to Cai et al. (2008), indicate that age and race are significant factors related to online banking adoption. There is empirical evidence that older Americans and African Americans have a greater level of distrust for financial institutions. In addition, researchers have found that trust is a significant factor related to electronic banking adoption. Our findings support both streams of literature.

Our study has limitations, however, due to the data used. The SCF asks respondents only if they use online banking, but does not ask why or why not. Therefore, we cannot definitively explain the differences in adoption across demographic groups. In addition, we do not have information about the technological savvy of the respondents or access to smartphones, computers, or the Internet. Future research should further investigate the link between trust and electronic banking adoption in the elderly and minority communities while controlling for issues related to access and computer literacy.

## Implications

Still, there are implications of these results for the financial services industry. As noted by Greenspan, financial innovations have historically made financial markets more accessible to a wider variety of consumers—particularly the economically disadvantaged. However, if issues related to trust or access limit the adoption of these innovations, they may not be as effective as envisioned. This study may be useful to financial institutions as many move away from traditional "bricks and mortar" operations to virtual operations. Such moves should take into consideration the characteristics of the affected communities. That is, replacing a traditional bank branch in a minority neighborhood with a fully automated one may result in a decline in deposits.

Finally, financial counselors, planners, and educators should be aware of these differences in adoption rates in light of

**TABLE 4. Probability of Online Banking Adoption**

| Variable | *AgeGroup × Black* | *AgeGroup × Female* | *AgeGroup × Business Owner* |
|---|---|---|---|
| | Panel A: Financial Literacy measured using *Knowledge* | | |
| Knowledge | 0.0468 (5.32)[c] | 0.0460 (5.21)[c] | 0.0474 (5.38)[c] |
| LnIncome | 0.1096 (7.72)[c] | 0.1102 (7.76)[c] | 0.1094 (7.71)[c] |
| 20–29 | 0.1232 (0.39) | 0.1206 (0.38) | −0.0278 (−0.09) |
| 20–29 × Black | −0.5908 (−4.04)[c] | | |
| 20–29 × Female | | −0.1293 (−0.95) | |
| 30–39 | −0.0992 (−0.32) | −0.1609 (−0.50) | −0.1681 (−0.52) |
| 30–39 × Black | −0.2915 (−2.27)[b] | | |
| 30–39 × Female | | −0.0651 (−0.55) | |
| 40–49 | −0.2272 (−0.73) | −0.2652 (−0.82) | −0.3092 (−0.96) |
| 40–49 × Black | −0.2397 (−1.98)[b] | | |
| 40–49 × Female | | −0.0894 (−0.76) | |
| 40–49 ×BusinessOwner | | | 0.4158 (2.30)[b] |
| 50–59 | −0.5843 (−1.88)[a] | −0.6157 (−1.92)[a] | −0.661 (−2.06) [b] |
| 50–59 × Black | −0.3078 (−2.81)[c] | | |
| 50–59 × Female | | −0.1882 (−2.00)[b] | |
| 50–59 × BusinessOwner | | | 0.1764 (1.34) |
| 60–69 | −0.9365 (−3.01)[c] | −1.0026 (−3.12)[c] | −1.0282 (−3.20)[c] |
| 60–69 × Black | −0.3627 (−3.22)[c] | | |
| 60–69 × Female | | −0.1150 (−1.21) | |
| 60–69 × BusinessOwner | | | 0.2076 (1.61) |
| 70–79 | −1.4198 (−4.54)[c] | −1.4316 (−4.42)[c] | −1.5785 (−4.89)[c] |
| 70–79 × Black | −0.8039 (−4.33)[c] | | |
| 70–79 × Female | | −0.4451 (−3.74)[c] | |
| 70–79 × BusinessOwner | | | 0.3770 (1.96)[a] |
| 80–89 | −1.7164 (−5.43)[c] | −1.7823 (−5.40)[c] | −1.7911 (−5.47)[c] |
| 80–89 × Female | | −0.0930 (−0.60) | |
| 80–89 × BusinessOwner | | | 0.0841 (0.32) |
| 90–95 | −2.1244 (−5.28)[c] | −2.2580 (−5.54)[c] | −2.2111 (−5.38)[c] |
| EducationLevel | 0.1544 (19.22)[c] | 0.1549 (19.26) | 0.1556 (19.42) [c] |
| Female | –0.1760 (–3.93)[c] | | −0.1820 (−4.07)[c] |
| Black | | −0.3896 (−7.41)[c] | −0.3843 (−7.36)[c] |
| #CreditCards | 0.1856 (13.66)[c] | 0.1850 (13.61)[c] | 0.1846 (13.62) [c] |
| BusinessOwner | 0.3014 (4.35)[c] | 0.3069 (4.42[c] | |
| Constant | −1.9284 (−5.70)[c] | −1.8808 (−5.44)[c] | −1.8295 (−5.26)[c] |
| Pseudo $R^2$ | 0.3019 | 0.3015 | 0.3000 |
| N | 6,248 | 6,248 | 6,248 |
| | Panel B: Financial Literacy measured using *FinLit%* | | |
| FinLit% | 0.4302 (6.02)[c] | 0.4288 (5.99)[c] | 0.4316 (6.04)[c] |
| LnIncome | 0.1110 (7.81)[c] | 0.1113 (7.83)[c] | 0.1108 (7.80)[c] |
| 20–29 | 0.2309 (0.74) | 0.1206 (0.38) | 0.0903 (0.29) |

(*Continued*)

**TABLE 4. Probability of Online Banking Adoption *(Continued)***

| Variable | *AgeGroup × Black* | *AgeGroup × Female* | *AgeGroup × Business Owner* |
|---|---|---|---|
| 20–29 × Black | −0.5701 (−3.91) [c] | | |
| 20–29 × Female | | −0.1311 (−0.97) | |
| 30–39 | −0.0048 (−0.02) | −0.0611 (−0.19) | −0.0588 (−0.19) |
| 30–39 × Black | −0.2516 (−1.96)[a] | | |
| 30–39 × Female | | −0.0476 (−0.40) | |
| 40–49 | −0.1342 (−0.44) | −0.1791 (−0.57) | −0.2082 (−0.66) |
| 40–49 × Black | −0.2276 (−1.89)[a] | | |
| 40–49 × Female | | −0.0498 (−0.42) | |
| 40–49 × BusinessOwner | | | 0.4189 (2.32)[b] |
| 50–59 | −0.4914 (−1.61) | −0.5171 (−1.64) | −0.5625 (−1.79)[a] |
| 50–59 × Black | −0.3064 (−2.80)[c] | | |
| 50–59 × Female | | −0.1977 (−2.10)[b] | |
| 50–59 × BusinessOwner | | | 0.1815 (1.37) |
| 60–69 | −0.8426 (−2.75)[c] | −0.9133 (−2.90)[c] | –0.9215 (−2.93)[c] |
| 60–69 × Black | −0.3403 (−3.03)[c] | | |
| 60–69 × Female | | −0.0818 (−0.86) | |
| 60–69 ×BusinessOwner | | | 0.1921 (1.49) |
| 70–79 | −1.3222 (−4.29)[c] | −1.3336 (−4.20)[c] | −1.4731 (−4.65)[c] |
| 70–79 × Black | −0.7944 (−4.23)[c] | | |
| 70–79 × Female | | −0.4320 (−3.62)[c] | |
| 70–79 ×BusinessOwner | | | 0.4017 (2.08)[b] |
| 80–89 | −1.6092 (−5.17)[c] | −1.6895 (−5.21)[c] | −1.6740 (−5.21)[c] |
| 80–89 × Female | | −0.0368 (−0.24) | |
| 80–89 × BusinessOwner | | | 0.0739 (0.28) |
| 90–95 | −2.0430 (−5.11)[c] | −2.1707 (−5.37)[c] | −2.1238 (−5.22)[c] |
| EducationLevel | −0.1502 (18.51)[c] | 0.1508 (18.58)[c] | 0.1515 (18.71) [c] |
| Female | −0.1571 (−3.49)[c] | | −0.1636 (−3.64)[c] |
| Black | | −0.3698 (−7.04)[c] | −0.3645 (−6.98)[c] |
| #CreditCards | 0.1846 (13.56)[c] | 0.1843 (13.53)[c] | 0.1837 (13.54) [c] |
| BusinessOwner | 0.3014 (4.34)[c] | 0.3072 (4.42)[c] | |
| Constant | −1.9720 (–5.89)[c] | −1.9286 (−5.65)[c] | −1.8813 (−5.49)[c] |
| Pseudo $R^2$ | 0.3029 | 0.3026 | 0.3010 |
| N | 6,248 | 6,248 | 6,248 |

***Note.*** This table presents the results of various probit model specifications using age group interaction terms. In each model specification, the dependent variable is the binary variable *OnlineBanking* that is set to 1 if the respondent reports that he engages in online banking and 0 otherwise. Regression coefficients are presented with *z*-scores in parentheses.
[a]Indicates significance at the 10% level. [b]Indicates significance at the 5% level. [c]Indicates significance at the 1% level.

**TABLE 5. Probability of Online Banking Adoption Using Knowledge**

| Panel A: African American Interactions | | |
|---|---|---|
| **Variable** | **1: *Black* × *Female*** | **2: *Black* × *BusinessOwner*** |
| *Knowledge* | 0.0471 (5.35)[c] | 0.0469[b](5.33)[c] |
| *LnIncome* | 0.1131 (8.06)[c] | 0.1135 (8.08)[c] |
| *AgeSq* | −0.0003 (−27.45)[c] | −0.0003 (−27.45)[c] |
| *EducationLevel* | 0.1542 (19.36)[c] | 0.1544 (19.38)[c] |
| *Female* | −0.1590 (−3.13)[c] | −0.1637 (−3.66)[c] |
| *Black* | −0.3716 (−5.36)[c] | −0.3989 (−7.45)[c] |
| *Black × Female* | −0.0230 (−0.22) | |
| *#CreditCards* | 0.1829 (13.59)[c] | 0.1823 (13.55)[c] |
| *BusinessOwner* | 0.3108 (4.51)[c] | 0.2777 (3.82)[c] |
| *Black × BusinessOwner* | | 0.3033 (1.35) |
| *Constant* | −1.6505 (−10.13)[c] | −1.6513 (−10.14)[c] |
| *Pseudo $R^2$* | 0.3019 | 0.3022 |
| *N* | 6,248 | 6,248 |
| Panel B: Female Interactions | | |
| Variable | 1: *Black×Female* | 3: *Female×BusinessOwner* |
| *Knowledge* | 0.0471 (5.35)[c] | 0.0469 (5.33)[c] |
| *LnIncome* | 0.1131 (8.06)[c] | 0.1146 (8.15)[c] |
| *AgeSq* | −0.0003 (−27.45)[c] | −0.0003 (−27.50)[c] |
| *EducationLevel* | 0.1542 (19.36)[c] | 0.1538 (19.30)[c] |
| *Female* | −0.1590 (−3.13)[c] | −0.1808 (−3.95)[c] |
| *Black* | −0.3716 (−5.36)[c] | −0.3807 (−7.31)[c] |
| *Black × Female* | −0.0230 (−0.22) | |
| *#CreditCards* | 0.1829 (13.59)[c] | 0.1835 (13.62)[c] |
| *BusinessOwner* | 0.3108 (4.51)[c] | 0.2605 (3.50)[c] |
| *Female × BusinessOwner* | | 0.3239 (1.67)[a] |
| *Constant* | −1.6505 (−10.13)[c] | −1.6554 (−10.16)[c] |
| *Pseudo $R^2$* | 0.3019 | 0.3023 |
| *N* | 6,248 | 6,248 |
| Panel C: Business Owner Interactions | | |
| Variable | 2: *Black×BusinessOwner* | 3: *Female×BusinessOwner* |
| *Knowledge* | 0.0469[b](5.33)[c] | 0.0469 (5.33)[c] |
| *LnIncome* | 0.1135 (8.08)[c] | 0.1146 (8.15)[c] |
| *AgeSq* | −0.0003 (−27.45) | −0.0003 (−27.50)[c] |
| *EducationLevel* | 0.1544 (19.38)[c] | 0.1538 (19.30)[c] |
| *Female* | −0.1637 (−3.66)[c] | −0.1808 (−3.95)[c] |
| *Black* | −0.3989 (−7.45)[c] | −0.3807 (−7.31)[c] |
| *#CreditCards* | 0.1823 (13.55)[c] | 0.1835 (13.62)[c] |

(*Continued*)

**TABLE 5. Probability of Online Banking Adoption Using Knowledge *(Continued)***

| Panel A: African American Interactions | | |
|---|---|---|
| **Variable** | **1: *Black* × *Female*** | **2: *Black* × *BusinessOwner*** |
| *BusinessOwner* | 0.2777 (3.82)[c] | 0.2605 (3.50)[c] |
| *Black* × *BusinessOwner* | 0.3033 (1.35) | |
| *Female* × *BusinessOwner* | | 0.3239 (1.67)[a] |
| *Constant* | −1.6513 (−10.14)[c] | −1.6554 (−10.16)[c] |
| *Pseudo* $R^2$ | 0.3022 | 0.3023 |
| *N* | 6,248 | 6,248 |

*Note.* This table presents the results of various probit model specifications using race, gender, and business ownership interaction terms. In each model specification, the dependent variable is the binary variable *OnlineBanking* that is set to 1 if the respondent reports that he engages in online banking and 0 otherwise. Regression coefficients are presented with *z*-scores in parentheses.
[a]Indicates significance at the 10% level. [b]Indicates significance at the 5% level. [c]Indicates significance at the 1% level.

**TABLE 6. Probability of Online Banking Adoption using *FinLit%***

| Panel A: African American Interactions | | |
|---|---|---|
| **Variable** | **1: *Black* × *Female*** | **2: *Black* × *BusinessOwner*** |
| *FinLit%* | 0.4270 (5.98)[c] | 0.4490 (6.29)[c] |
| *LnIncome* | 0.1144 (8.14)[c] | 0.1163 (8.33)[c] |
| *AgeSq* | −0.0003 (−27.43)[c] | −0.0003 (−27.37)[c] |
| *EducationLevel* | 0.1501 (18.66)[c] | 0.1524 (19.03)[c] |
| *Female* | −0.1384 (−2.71)[c] | −0.1592 (−3.55)[c] |
| *Black* | −0.3478 (−5.04)[c] | −0.4079 (−7.66)[c] |
| *Black* × *Female* | −0.0340 (−0.33) | |
| *#CreditCards* | 0.1820 (13.50)[c] | 0.1836 (13.66)[c] |
| *BusinessOwner* | 0.3104 (4.50)[c] | |
| *Black* × *BusinessOwner* | | 0.6519 (3.06)[c] |
| *Constant* | −1.5970 (−9.98)[c] | −1.6202 (−10.20)[c] |
| *Pseudo* $R^2$ | 0.3029 | 0.3014 |
| *N* | 6,248 | 6,248 |
| Panel B: Female Interactions | | |
| Variable | 1: *Black*×*Female* | 3: *Female*×*Business Owner* |
| *FinLit%* | 0.4270 (5.98)[c] | 0.4314 (6.04)[c] |
| *LnIncome* | 0.1144 (8.14)[c] | 0.1160 (8.23)[c] |
| *AgeSq* | −0.0003 (−27.43)[c] | −0.0003 (−27.48)[c] |
| *EducationLevel* | 0.1501 (18.66)[c] | 0.1496 (18.59)[c] |

(*Continued*)

**TABLE 6. Probability of Online Banking Adoption using *FinLit% (Continued)***

| Panel A: African American Interactions | | |
|---|---|---|
| **Variable** | **1: *Black* × *Female*** | **2: *Black* × *BusinessOwner*** |
| *Female* | −0.1384 (−2.71)[c] | −0.1650 (−3.58)[c] |
| *Black* | −0.3478 (−5.04)[c] | −0.3615 (−6.95)[c] |
| *Black* × *Female* | −0.0340 (−0.33) | |
| *#CreditCards* | 0.1820 (13.50)[c] | 0.1825 (13.53)[c] |
| *BusinessOwner* | 0.3104 (4.50)[c] | 0.2525 (3.39)[c] |
| *Female* × *BusinessOwner* | | 0.3740 (1.91) [c] |
| *Constant* | −1.5970 (−9.98)[c] | −1.6046 (−10.03)[c] |
| *Pseudo $R^2$* | 0.3029 | 0.3033 |
| *N* | 6,248 | 6,248 |
| Panel C: Business Owner Interactions | | |
| Variable | 2: *Black*×*BusinessOwner* | 3: *Female* ×*BusinessOwner* |
| *FinLit%* | 0.4490 (6.29)[c] | 0.4314 (6.04)[c] |
| *LnIncome* | 0.1163 (8.33)[c] | 0.1160 (8.23)[c] |
| *AgeSq* | −0.0003 (−27.37)[c] | −0.0003 (−27.48)[c] |
| *EducationLevel* | 0.1524 (19.03)[c] | 0.1496 (18.59)[c] |
| *Female* | −0.1592 (−3.55)[c] | −0.1650 (−3.58)[c] |
| *Black* | −0.4079 (−7.66)[c] | −0.3615 (−6.95)[c] |
| *#CreditCards* | 0.1836 (13.66)[c] | 0.1825 (13.53)[c] |
| *BusinessOwner* | | 0.2525 (3.39)[c] |
| *Black* × *BusinessOwner* | 0.6519 (3.06)[c] | |
| *Female* × *BusinessOwner* | | 0.3740 (1.91)[c] |
| *Constant* | −1.6202 (−10.20)[c] | −1.6046 (−10.03)[c] |
| *Pseudo $R^2$* | 0.3014 | 0.3033 |
| *N* | 6,248 | 6,248 |

*Note.* This table presents the results of various probit model specifications using race, gender, and business ownership interaction terms. In each model specification, the dependent variable is the binary variable *OnlineBanking* that is set to 1 if the respondent reports that he engages in online banking and 0 otherwise. Regression coefficients are presented with *z*-scores in parentheses.

[a]Indicates significance at the 10% level. [b]Indicates significance at the 5% level. [c]Indicates significance at the 1% level.

electronic banking trends in the financial services industry. While financial innovation aims to make financial markets accessible to more people, these results indicate that certain groups are late adopters of financial technology. This delay may result in differences in access to capital and financial services as compared to those who are more likely to adopt new financial technology such as electronic banking. Awareness of and sensitivity to these differences will allow counselors, planners, and educators to provide additional education as needed. Counselors may want to determine the reasons why a client elects not to use electronic banking services and help the client overcome any issues he faces related to access, security, training, and so forth. Planners may want to include alternatives to electronic

banking in any proposed financial planning implementation strategies so as to accommodate any concerns a client might have. Educators likely have the greatest opportunity to address the disparity in electronic banking adoption rates by demystifying the various forms of electronic banking and providing assurances to those who are skeptical of the safety and efficiency of its use. With this information regarding differences in electronic banking rate adoption across demographic groups, counselors, planners, and educators can help to address misconceptions, offer alternatives, and provide training to those who may be harmed due to their resistance.

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***Disclosure.*** The authors have no relevant financial interest or affiliations with any commercial interests related to the subjects discussed within this article.

***Funding.*** The author(s) received no specific grant or financial support for the research, authorship, and/or publication of this article.