Consumers' Use of Electronic Technologies in Financial Services: A View Toward the 21st Century

Consumer's use of electronic technologies in financial services is empirically examined in this paper using the University of Michigan's 1996 Survey of Consumers. While consumer's adoption of ATM has a positive influence on adoption of direct deposit and phone banking, their use of ATM does not influence the adoption of direct payment. Factors influencing consumers' use of various electronic technologies vary according to a specific type of electronic technology.

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Background

Over the years, consumers have seen numerous changes in how they relate to their banks and other financial service providers. Some of these changes are demand-side driven: busy families want faster and more convenient ways to handle financial transactions. And some of these changes are supply-side driven: in an effort to control costs, financial service firms are turning to high tech/low touch methods to provide financial transactions and customer service.

About 85 percent of households have one or more electronic funds transfer (EFT) feature on their bank accounts (Federal Reserve, 1999). Automated teller machines (ATMs) are the most widely used EFT service; 67 percent of households report they have an ATM card, but only 34 percent report that they use it regularly (Kennickell and Kwast, 1997). In 1998, the number of ATM transactions averaged 930 million per month, up from 910 million per month in 1997. Point-of-sale (POS) transactions have also increased dramatically, growing from 120 million a month in 1997 to 150 million per month in 1998 (Federal Reserve, 1999). Some of the POS transactions use financial institutions' ATM cards, while others use branded debit cards (Visa or MasterCard "check cards").

More than half (59 percent) of all U.S. households use direct deposit for pay or benefits; nearly 80 percent of all federal benefits (Social Security payments, Veterans payments, etc.) are delivered via EFT (U.S. Treasury, 1998). However, less than one in four households (23 percent) use direct payments or pre-authorized debits for payments such as utilities or mortgages (Kennickell & Kwast, 1997).

Consumer adoption of some of the more innovative electronic delivery methods is low, but their use is growing. Banking by phone has been around for a while, but only one in four (26 percent; Kennickell and Kwast, 1997) report using phone banking. Home or personal computer banking was initiated in the mid-1980's, but is just now catching on. INTECO, a technology-related market research firm, reports that 7 million households used personal computer banking in 1998, up from 3.8 million in 1997 (INTECO, 1999). And with growing computer use, electronic bill presentment and bill payment are coming into their own; for example, CheckFree indicates they provide services to 2.6 million consumers (PRNewswire, 1999).

Stored-value or smart cards have met with mixed results from consumers. Pilot tests during the Atlanta Olympics and in Manhattan have not been successful. However, in closed environments, like the military or on college campuses, these electronic technologies seem highly successful. Pre-paid phone cards and gift cards have successfully made their way into the marketplace, indicating that consumers may be willing to think about stored-value or smart cards in more focused transactions (Kutler, 1999; Sabatini, 1999).

As banking moves to a more technologically-delivered service, consumer educators, bankers, and policy makers need to know which factors are associated with consumer's use of various electronic technologies in their financial service transactions, which groups may become disadvantaged by increased use of technologically delivered financial services, and what they can do to help consumers adapt to these changing technologies. These are the topics that we will explore in this paper.

Literature Review

Over time, the banking industry has introduced a variety of technology-based electronic banking services to consumers. Each of these electronic financial services is at a different stage of the diffusion process. Automated Teller Machines (ATMs) are the most diffused and at the late majority stages of adoption according to Rogers' classification of the adoption process (Prendergast 1993). Electronic fund transfers such as direct payments and electronic billing are, compared to ATMs, relatively new to financial customers. Telephone banking, while an older technology, is still at the early stages of diffusion.

Several theories suggest that prior experience with a particular innovation (e.g. using an ATM) influences consumers' subsequent adoption decisions of related innovations (e.g. other electronic banking technologies). First, learning theory proposes that consumer's experience with a particular product lead to an increased familiarity with other products within the same product category (Hirschman 1980; Dickerson and Gentry 1983). This increased familiarity is expected to transfer into a willingness to adopt. Hirschman (1980) explains this relationship under a cognitive resource paradigm. Consumer's adoption of a particular innovation is inversely related to the amount of cognitive efforts required to comprehend the particular innovation. Familiarity with a product class obtained through prior experience greatly reduces the cognitive effort required for other innovations in the same product class.

Familiarity induced by increased exposure can also lead to favorable attitudes (Schumann et al. 1990). Fiske (1982) and Sujan (1985) discussed the impact of prior experience in terms of category-based affect under information processing paradigm. Based on the information-processing paradigm, prior experience with a particular innovation is stored as an affective response, and when a consumer is faced with similar situations, a category-based affect is triggered and affects the current decisions. Similarly, personality and attitude paradigms suggest that certain consumers view technology-based service more favorably, thus they are more likely to adopt technological innovations (Dickerson and Gentry 1983; Dabholkar 1996).

In this study, consumers' use of ATMs is hypothesized to affect subsequent adoption of other electronic financial services such as direct deposit, direct payment, and telephone banking. Users of ATM technology, once they have adopted and used the technology, are more likely to adopt other electronic-based financial services. On the other hand, those who do not actively use ATMs are expected to be less likely to adopt other electronic-based financial technologies. Some consumers do not use ATMs, while others have tried but do not actively use them. Inactive use of ATMs suggests consumers' lack of interest in adopting other electronic technologies.

Methods

Data

We used the data from the December 1996 Survey of Consumers collected by the University of Michigan. The data contain information on household demographics, households' assessments of their current and future financial well being, the current and future state of the economy, their willingness and ability to purchase certain durable goods, and their attitudes towards using credit to purchase goods. Commissioned by the Federal Reserve Board, additional data were collected on consumer's usage of electronic banking technologies. There were 501 respondents in the Survey. Among the respondents, only households with checking or savings accounts at financial institutions that offered their customers access to ATMs were included in the analysis. In all, 419 of the 501 households interviewed were included.

Analysis

We used a two-stage analysis to determine the factors related to using specific electronic technologies. In the first stage, we estimated a model of ATM use. Given the diffusion of ATM technology in the marketplace and the potentially strong tie-ins between using an ATM and adopting other electronic technologies, it was necessary to control for ATM use in subsequent models.

In the second stage of analysis, we estimated models of electronic technology use for direct deposit, direct payment, and telephone banking. These specific electronic technologies were chosen because sufficient numbers of households were using such technologies. Only two percent of households reported using PC banking and 4.7 percent reported using debit cards; thus these two technologies were dropped from the second stage analyses.

Variables

The dependent variable of the first stage model is whether or not consumer use ATM. As explanatory variables, the cost and convenient location of using ATMs were included in the first stage model. The Survey also

included eight attitudinal questions on use ATMs relative to "regular banking." Two factors emerged in a factor analysis of these variables, and the factor scores were included in the first stage model.

In addition, the demographic variables were included in both first and second stage models. Race/ethnicity, age, education, household income, marital status, were measured differently in the two stages of modeling. Region was omitted from the first stage model, but was included in the second stage models.

The dependent variables of the second stage model include whether or not consumers adopted direct deposit, direct payment, and phone banking. The parameter estimates from the first stage model were used to compute a "probability of ATM use" variable. This variable was used as a control variable in second stage models (direct deposit, direct payment, and telephone banking). A binomial attitudinal variable measuring interest in electronic devices was also included in the second stage models.

Results

Descriptive Results

Slightly over three-fifths (62.5%) of the households used ATMs and more than half (57.3%) of the households used direct deposit. Use of direct payment, telephone banking, debit cards, and computer banking were much lower for these households (35.3%, 19.6%, 4.7%, and 2.1%, respectively).

The majority of the respondents in our study sample were white (81.4%), female (60.4%), and married (63.9%). Nearly half (47.5%) of the respondents were between the ages of 36 and 55 (median age was 42), and approximately two-fifths (39.7%) had college degrees (median education was 14 years). Nearly three-quarters (74.5%) reported that they worked at least part-time. Most households (52.0%) did not have any children and one-third (33.2%) of the households were from the South. The average household income in 1995 dollars was $49,979, with a median of $42,000.

A majority (71.6%) of these respondents viewed electronic devices favorably. Only a small proportion (19.2%) of the respondents stated that ATMs were located at more convenient locations than where they could cash checks. The cost of using ATMs for cash as opposed to writing checks apparently was not a deterrent to using ATMs given that only a small proportion of respondents (11.4%) stated that ATMs cost more than writing checks.

First Stage Model – ATM Use

In the factor analysis of attitudes toward ATM use, two factors emerged: perceived convenience (saving time, better hours, more locations, etc.) and perceived risk (more frequent mistakes, difficult to correct mistakes, greater risk of being robbed, etc.). Principal factor analysis was used and the two aforementioned factors emerged. Maximum likelihood factor analysis was then run using these two factors, and the factors were rotated using VARIMAX rotation. The eigen values for the two factors were 4.4741 (perceived convenience) and 1.6593 (perceived risk). These factor scores were both positively related to ATM use; more positive attitudes towards ATM technology relative to "regular banking" increased the likelihood of using ATMs.

In the first stage model, respondents who stated that it cost more to use ATMs than to write checks and that ATMs were located at more convenient locations than where they could cash checks were more likely (2.9 times and 4.6 times, respectively) to use ATMs (see Table 1). Older respondents were less likely than younger respondents to use ATMs, and males were 1.8 times more likely than females to use ATMs. Households in the highest income category ($60,001 and up) were 2.2 times more likely to use ATMs than households in the middle income category ($30,001 - $60,000). The average predicted probability of using ATMs, 0.62, was consistent with the observed use rate (0.625), indicting that the model works well for our purposes.

Second Stage - Use of Other Electronic Banking Technologies

Influencing factors varied across different types of electronic banking technologies. Increases in the probability of using ATMs increased the likelihood of using direct deposit and telephone banking, but did not increase the likelihood of using direct payment (see Table 2). Being employed increased the likelihood of using direct deposit, as might be expected, but was not significantly related to the likelihood of using other technologies. Respondents between the ages of 18 and 35 were half as likely to use direct deposit and half as likely to use direct payment compared to respondents between the ages of 36 and 55. Increases in household income also increased the likelihood of using any of the electronic banking technologies studied.

Respondents with a high school education or less were 0.6 times less likely to use direct deposit and 0.5 times less likely to use telephone banking compared to the respondents with a college degree. Married respondents were more likely to use direct payment than non-married respondents. Households with children were 1.8 times

Table 1
1st Stage Model:
Logistic Analysis of Using ATM's

Variable	Parameter Estimates (p-values)
Intercept	1.3750 (0.2576)
Cost More	1.0765 (0.0287)
More Convenient	1.5350 (0.0015)
Factor1 (convenience)	1.1952 (0.0001)
Factor2 (risk)	1.3046 (0.0001)
Income $0 - $30,000	0.3906 (0.2834)
Income $60,001 +	0.7940 (0.0355)
Education	0.0173 (0.8099)
Age	-0.0381 (0.0046)
Working	-0.1046 (0.7721)
Married	0.2369 (0.6178)
Previously Married	-0.1614 (0.7676)
Children	-0.4559 (0.1924)
Male	0.5986 (0.0462)
Black	0.8054 (0.1287)
Hispanic	-0.1477 (0.7888)
N =	377
-2 log likelihood	177.917
Chi-Square for Cov.	(0.0001)

Table 2
2nd Stage Models:
Logistic Analysis of Using Electronic Technologies
(parameter estimates, p values)

Variables	Direct Deposit	Direct Payment	Phone Banking
Intercept	-5.0705 (0.0124)	-5.8502 (0.0083)	-9.8434 (0.0003)
Prob. ATM Use	1.4169 (0.0023)	0.4700 (0.3112)	1.7605 (0.0042)
Like Electronic Devices	-0.2516 (0.3526)	-0.0182 (0.9487)	0.4311 (0.2341)
Working	0.5043 (0.1000)	0.2889 (0.3679)	0.2091 (0.5917)
Age 18 – 35	-0.5688 (0.0372)	-0.5810 (0.0396)	-0.3792 (0.2596)
Age 56 +	1.5630 (0.0002)	-0.2010 (0.6253)	0.3044 (0.5648)
Log Income	0.4146 (0.0335)	0.3969 (0.0596)	0.6702 (0.0088)
High School or Less	-0.5165 (0.0565)	-0.0690 (0.8064)	-0.5999 (0.0801)
Some College	-0.1750 (0.5633)	0.2262 (0.4686)	-0.4457 (0.2223)
Married	0.3555 (0.1814)	0.7613 (0.0083)	-0.0812 (0.8154)
Children	0.5782 (0.0288)	0.4914 (0.0671)	0.3170 (0.3250)
Male	-0.4798 (0.0521)	-0.1594 (0.5278)	-0.7429 (0.0159)
White	-0.3071 (0.3091)	0.2064 (0.5171)	-0.3547 (0.3401)
North East	-0.1898 (0.5515)	-0.2964 (0.3631)	0.5957 (0.1319)
Mid West	-0.1383 (0.6397)	-0.0929 (0.7579)	0.9370 (0.0117)
West	0.0296 (0.9281)	-0.5602 (0.1191)	-0.0164 (0.9710)
N =	375	377	377
-2 log likelihood	47.811	48.911	53.247
Chi-Square for Cov.	(0.0001)	(0.0001)	(0.0001)

more likely to use direct deposit and 1.6 times more likely to use direct payment compared to those without children. Males were less likely to use direct deposit and less likely to use phone banking. Relative to living in the South, households in the west were less likely to use direct payment while households in the mid-west were more likely to use phone banking.

Simulation of Adoption of Electronic Technologies

We performed several simulations, looking at adoption by income, age, education, and race. We calculated the probability of adoption by manipulating the variable of interest while holding other independent variables constant at the mean or modal value. For example, we evaluated the effects of being in a low or high income

household by assigning income values of $15,000 and $50,000 respectively, while assigning the mean probability of using an ATM (.62) and the modal value for categorical variables (e.g. since 75% of the sample worked, the variable "working" was assigned a 1). For age, education, and race, we simply evaluated the probability for each category, holding all else constant at the means or modes. Results of these simulations are presented in Table 3.

As already seen by the regression results and the odds ratios, higher income households are more likely to use these electronic technologies than lower income households. Older households are more likely to use direct deposit and phone banking, but middle-aged households are more likely to use direct payment. Minority households are more likely to use direct deposit and phone banking, but white households are more likely to use direct payment. College graduates were more likely to use direct deposit and phone banking, but persons with some college (but not a college degree) were more likely to use direct payment.

Table 3
Simulation of Adoption of Electronic Technologies

	Direct Deposit	Direct Payment	Phone Banking
Low Income ($15,000)	.52	.37	.10
High Income ($50,000)	.64	.49	.21
Age 18-35	.48	.33	.14
Age 36-55	.62	.47	.19
Age 56 and over	088	.42	.24
White	.62	.47	.19
Minority	.69	.42	.25
High School or Less	.50	.45	.11
Some College	.58	.53	.13
College Degree	.62	.47	.19

Discussion and Conclusions

In this paper, we looked at consumers' adoption of electronic technologies in the financial services field. Using data from a 1996 Survey of Consumers by the University of Michigan Survey Research Center, we find support for the theory that prior experience with an innovation leads to subsequent adoption of other innovative technologies. Adoption and use of ATMs positively influenced adoption of direct deposit and phone banking; use of direct deposit positively influenced adoption of direct payment. In addition to the adoption of other innovations, employment status, age, education, income, presence of children, gender, and region also influenced adoption of other electronic banking technologies. Thus, consumers who are younger, have lower incomes, and/or have less education will be differentially affected by the move toward electronic delivery of financial services.

Consumer educators have long been designing their outreach efforts based on the experiences of their audiences; these results confirm that this practice is especially necessary in the case of educating about electronic banking. Consumers who are already familiar with ATMs or direct deposit can more easily be "brought up to speed" on other technologies. Consumers unfamiliar with any of the electronic banking technologies may need help in learning how to manage their accounts with these services. For example, consumers many need to learn how to create a "paper trail" where only an "electronic trail" exists. Consumers may also need to be reminded of their rights under the Electronic Funds Transfer Act (and Regulation E) as they move toward more electronically-delivered banking services.

As the electronic delivery of banking and financial services continues to develop, policy makers may need to consider issues of accessibility. If low income and less educated households are less likely to access accounts electronically, then they may not be able to participate as much as they could in the financial marketplace. Already many banks are charging consumers to "talk to a teller," and it may be that the financial marketplace evolves into a tiered structure where those with substantial balances have "personal bankers," those without accounts deal with staff at check cashing outlets, and those in the middle deal with financial institutions electronically. Also, as new electronic products and services emerge, policy makers will need to review the existing consumer protection paradigm to make sure it still fits the delivery mechanisms that evolve. A balance of both regulation and education is needed to address the consumer protection issues in the twenty-first century's financial service marketplace.

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