# Consumer Payment Choices:  Paper, Plastic – or Electrons?

Using data from the Surveys of Consumers, this paper examines the portfolio of payment choices that different groups of consumers use and identifies the socio-economic, demographic, and attitudinal characteristics of groups of consumers that fall within those choice sets.  We find that younger, married, more highly educated, higher income, higher asset households were more likely to adopt a broad range of the electronic payment choices.  We also find that consumers' attitudes and perceptions of e-banking, in terms of security and privacy, convenience, and familiarity and ease of use were significant correlates of payment choices.

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## Introduction

Consumers today have a broad, and growing, range of choices when it comes to paying bills, paying for purchases, and managing their cash flow.  This "portfolio" of payment mechanisms includes traditional methods, such as cash, checks, and credit cards, as well as more recent technologies such as debit cards, online bill payment, automatic bill payment, and stored value cards.

Policy makers, financial institutions, and consumer educators all have an interest in the evolving payment system.  Policy makers want to know how consumer protection laws and regulations need to be adapted to account for the wider range of choices in the market place.  Financial institutions want to know how to package and market their products and services to take advantage of more efficient payment processing.  And consumer educators want to help consumers navigate this new marketplace while safeguarding their finances and managing their cash flow.

The objectives of this paper are to shed some light on the combinations of payment choices consumers utilize and to identify the socio-economic, demographic, and attitudinal characteristics of groups of consumers that fall within those choice sets.

## Literature Review

Two theories have emerged to explain why and how consumers adopt new technologies.  Both are relevant to an evolving payment system:  The Technology Acceptance Model (TAM; Davis, 1989) and the Diffusion of Innovations (Rogers, 1962).  These models incorporate the idea of relative advantage, among other characteristics of new technologies, that prompt consumers to both try and adopt them.  Rogers' characterization of relative advantage is the degree to which consumers perceive a new product or service as different from and better than its substitutes.  In the TAM model, the counterpart to relative advantage is perceived usefulness (Davis, 1989).  In the case of electronic payments, savings of time, money and convenience have been cited as relative advantages, while financial management conducted online raises concerns of privacy, a relative disadvantage for some (Abbate, 1999, Snel, 2000).  Empirical literature on the diffusion of technologies using the TAM model and its extensions have found consistently positive relationships between usefulness and to a lesser extent, ease of use, and the adoption of a variety of different specific technologies, ranging from computer software to email (see, for example, Davis, 1989; Chau and Hu, 2001; Karahanna, Straub and Chervany, 1999).

Overall, the literature tells us almost unequivocally that the more observable, compatible, simple, and useful the technology is, and the more advantages a technology offers, the more likely consumers are to adopt that technology.  Increases in income and education also elicit a positive effect on adoption, regardless of the technology.  On the other hand, the impacts of other demographic characteristics on adoption are less clear.  Some previous studies have not controlled for demographic characteristics.  For those that have included demographics (family composition, type of job, job tenure), there are not enough replications to compare results across studies, or to generate meaningful hypotheses.

Explorations of demographic correlates of technology acceptance have produced mixed results.  Gender (being male or female) has not been found to have a direct effect on adoption of technology in general (Taylor and Todd, 1995; Gefen and Straub, 1997), but men and women do appear to have different acceptance rates of various computer technologies.  More recent work on gender differences (that is cultural and social role differences between

males and females) suggests that there are differences in information processing between men and women (Putrevu, 2001). Early work by Zeithmahl and Gilly (1987) found positive relationships between education, income, and exposure to mass communication and the adoption of electronic funds transfer (EFT), and that the effect was greater for younger than for older consumers. Lee, Lee and Schumann (2002) found the effect of age was one of decreasing adoption of technological innovations at a decreasing rate. In the general realm of diffusion of innovations, increases in income and education, have been found to be positively related to the adoption of an innovation (Donnelly, 1970; Uhl, Andrus, & Poulsen, 1970; Labay & Kinnear, 1981; Kennickell & Kwast 1997; Lee & Lee 2000; Lee, Lee & Schumann, 2002).

Previous research on electronic banking and payments has focused on the adoption of individual technologies (see, for example, Anguelov, Hilgert, & Hogarth, 2004; Cuevas, 1998; Daniel, 1999; Howcroft, Hamilton & Hewer, 2002; Jayawardhena & Foley, 2000; Karjaluoto, Matilla, & Pento, 2002; Kennickell & Kwast, 1997; Lee, Lee, & Eastwood, 2003; Mantel, 2000; Matilla, 2001; Prendergast, 1993; Zeithaml & Gilly, 1987). Only a few studies have explored the combinations of payment products and services consumers use (Kolodinsky, Hogarth & Hilgert, 2004; Lee & Lee, 2000; Lockett & Littler, 1997; Yang, Cai, & Cude, 2005), but these all included selected combinations of payment services as control variables, not as analysis variables.

## Data and Methodology

Data

The Surveys of Consumers were initiated in the late 1940s by the Survey Research Center at the University of Michigan. The purpose of these surveys is to measure changes in consumer attitudes and expectations with regard to consumer finance decisions. Each monthly telephone survey of 500 households includes a set of core questions covering consumer attitudes and expectations along with socioeconomic and demographic characteristics (see Curtin, 2001 for more information). For two months, in June and July, 2003, the Federal Reserve Board commissioned additional questions on the Surveys of Consumers, covering various topics related to e-banking services. The surveys yielded data from 1,002 respondents. Consumers without a bank account in the last twelve months were excluded from the dataset. The final dataset had 872 observations.

Dependent Variable. Respondents were asked about their use and expected future use of a variety of e-banking products: ATMs, debit cards, pre-paid (stored-value) cards, smart cards, electronic funds transfers, direct deposit, automatic bill paying (preauthorized debits), phone banking, and PC banking. Of these, we included seven in this study: ATMs, debit cards, automatic bill paying (preauthorized debits), phone banking, PC banking, prepaid cards (stored value), and smart cards. An admitted short-coming of this data set is that it focused on electronic banking, and did not include information on other payment choices, such as paying with cash, checks, or credit cards.

We used cluster analysis to group consumers who used various combinations of these payment technologies. Cluster analysis enables the grouping of consumers by their behavioral characteristics; this methodology is often used as a segmentation technique by marketers. Only payment behaviors were used to form the clusters. We used the k-means cluster analysis methodology to separate consumers; five clusters emerged from the data, with an initial sort based on ATM use.

Socioeconomic and Demographic Variables. The Surveys of Consumers collect information on a variety of household socioeconomic and demographic characteristics that have been found to be related to the adoption of various e-banking technologies. Among these, variables included in this study were household income (measured as income quintiles), age (included as a categorical variable), education (included as a categorical variable), race/ethnicity, marital status and gender, asset ownership (measured as being a home owner and owning stock), and region.

Attitudinal Variables. Participants also were asked to respond to a series of statements regarding their perceptions about e-banking in general and factors associated with the diffusion of innovations. These statements were created using the theoretical foundations provided by the Technology Acceptance Model and Diffusion of Innovations models (Rogers, 1962; Davis, 1989) and measures found in previous research. As in previous studies, the statements were adapted to fit with the specific technology being examined (in this case, e-banking; see, for example, Chau and Hu, 2001; Davis, Bagozzi and Warshaw, 1989; Davis, 1989). Fourteen statements were developed that specifically relate to e-banking. Responses were on a 5-point Likert scale from strongly agree to strongly disagree.

The statements were grouped into three sets reflecting characteristics found by earlier research to be associated with adoption of electronic technologies: convenience, familiarity and ease of use, and security and

privacy. These three sets of statements were used to create three indexes of perceptions of electronic banking. The statements that make up each of the indexes are shown in the appendix table.

The indices are ordinal, as we simply summed answers to Likert scale responses. Our goal was to create groups of respondents based on their summated scores. Because some statements about e-banking were positive (for example, "E-banking is convenient") while others were negative (for example, "E-banking is difficult to use"), the responses for all of the negative statements were reversed to a positive scale. Thus, higher scores reflect more positive attitudes toward e-banking. For example, a total score of 20 on the convenience index, which is made up of four statements, would indicate a very positive perception – a "strongly agree" response to each of the four statements.

Each respondent's total score on each index was calculated as a percentage of the maximum possible score for that index – 20 for the convenience index, 30 for the familiarity and ease of use index, and 20 for the security and privacy index. We then used interquartile ranges to group the respondents. Those in the 75th or higher percentile were grouped together (the "high" group). Those in the 50th to 74th percentile formed the second group ("medium"), and those below the 50th percentile formed the third group ("low").

Methodology

We explored the descriptive characteristics of the five cluster groups, and used bi-nomial hypothesis tests to determine whether respondent characteristics are related to the assigned cluster. We then used multinomial logit to predict membership in each cluster based on respondent characteristics. This multivariate regression technique allows us to examine the impact of each characteristic on cluster membership, controlling for the effect of each of the other characteristics. Finally, we calculated the probabilities for being in each of the clusters for different types of consumers.

**Results**

Description of the Clusters

The first cluster consists of 7 percent of the sample and includes consumers who do not use any of the seven electronic payment systems (EPS) discussed in this paper (Table 1). We have called these consumers "technophobes." The second cluster, labeled the "prepaid-underbanked," contains 18 percent of the sample. The members of this cluster use prepaid cards, however they do not use other electronic payment systems to any great extent. We have adopted the term "underbanked" for this group because although they have bank accounts, they do not seem to be making use of many of the features of these accounts (that is, they don't use ATMs, debit cards, automatic bill payment, etc.). We refer to the third cluster, 4 percent of the sample, as the "convenience seekers." These consumers use automatic bill payment, phone and PC banking but do not use the remaining technologies. Cluster four is known as the "technophiles" group; these consumers use all the technologies available to them, except for smart cards. It is important, however, to understand that smart card usage is relatively low for the entire sample (only 6% used smart cards). This cluster contains three-fifths of the observations in our sample (61%). The final cluster, called the "ATM/debit underbanked," consists of 10 percent of the sample. This group uses ATM and debit cards, which we consider to be complementary technologies, and does not use phone or PC banking, automatic bill payments, prepaid cards, and smart cards.

Table 1.
Clusters and Mean Proportion of Consumers Using Each Technology

|  | Technophobes | Prepaid-underbanked | Convenience seekers | Technophiles | ATM/debit underbanked |
|---|---|---|---|---|---|
| ATM | 0 | 0.09 | 0 | 0.87 | 0.92 |
| Phone Banking | 0 | 0.19 | 0.44 | 0.59 | 0.26 |
| Auto Bill Payment | 0 | 0.22 | 0.61 | 0.63 | 0.17 |
| PC Banking | 0 | 0.07 | 0.42 | 0.62 | 0.17 |
| Debit | 0 | 0.05 | 0 | 0.75 | 0.61 |
| Smart Cards | 0 | 0.03 | 0 | 0.10 | 0 |
| Prepaid Cards | 0 | 1.0 | 0 | 0.91 | 0 |
| N (%) | 58 (6.7%) | 160 (18.3%) | 38 (4.4%) | 529 (60.7%) | 87 (10.0%) |

Characteristics of Consumers in Each of the Clusters

Table 2 contains the medians and proportions of the socioeconomic, demographic and attitudinal independent variables by cluster. Descriptive results for the individual attitude questions are presented in the appendix.

Socioeconomic and demographic characteristics. Technophobes tend to fall into lower income brackets, with a median income of only $30,000 compared with the median income of the technophiles and convenience seekers, which is $57,500 and $59,000 respectively. In addition, 48.8% of technophobes have income of $30,000 or less compared with only 13.4% of technophiles (data not shown). Prepaid-underbanked and ATM/debit card users have very similar income distributions with $50,000 being the median income for both groups. While convenience users seem to have a slightly higher median income, there is no significant difference between them and the other three groups that used e-banking, while technophobes have a significantly lower median income compared with the other 4 groups.

Table 2.
Socioeconomic, Demographic, and Attitudinal Characteristics by Cluster Group (in percents except as noted)

| | Techno-phobes | Prepaid-underbanked | Convenience seekers | Techno-philes | ATM/debit-underbanked | Sig. diff.* |
|---|---|---|---|---|---|---|
| *Household Income* | | | | | | |
| Median (2003 dollars) | 30000 | 50000 | 59000 | 57500 | 50000 | |
| Distribution by quintile | | | | | | 1,2,3,4, 6,10 |
| 1st quintile (base category) | 48.84 | 21.43 | 12.12 | 13.52 | 18.29 | |
| 2nd quintile | 9.3 | 19.29 | 15.15 | 18.29 | 19.51 | |
| 3rd quintile | 13.95 | 23.57 | 30.3 | 22.86 | 28.05 | |
| 4th quintile | 11.63 | 19.29 | 18.18 | 22.27 | 23.17 | |
| 5th quintile | 16.28 | 16.43 | 24.24 | 23.06 | 10.98 | |
| *Age* | | | | | | |
| Median (years) | 64 | 52 | 53 | 42 | 52 | |
| Distribution by category | | | | | | 1,2,3,4, 6,8,10 |
| Less than or equal to 35 | 3.45 | 13.84 | 5.41 | 29.73 | 20.69 | |
| Between 35 and 59 (base) | 32.76 | 39.62 | 54.05 | 50.38 | 33.33 | |
| 60 and over | 63.79 | 46.54 | 40.54 | 19.89 | 45.98 | |
| *Education* | | | | | | |
| Median (years) | 12 | 13 | 14 | 14 | 13 | |
| Distribution by category | | | | | | 3,6,9,10 |
| H.S. diploma or less (base) | 51.79 | 38.36 | 21.05 | 22.92 | 41.38 | |
| Some college | 12.5 | 19.5 | 36.84 | 23.86 | 25.29 | |
| Bachelor's degree | 17.86 | 20.75 | 36.84 | 32.58 | 18.39 | |
| More than Bachelor's | 17.86 | 21.38 | 5.26 | 20.64 | 14.94 | |
| *Race/Ethnicity* | | | | | | 3,4,6,7, 8,9 |
| White (base) | 94.64 | 89.94 | 97.3 | 81.29 | 78.57 | |
| Black | 3.57 | 5.03 | 2.7 | 7.21 | 8.33 | |
| Hispanic | 0 | 2.52 | 0 | 7.41 | 7.14 | |
| Other | 1.79 | 2.52 | 0 | 4.09 | 5.95 | |

|  | Techno-phobes | Prepaid-underbanked | Convenience seekers | Techno-philes | ATM/debit-underbanked | Sig. diff |
|---|---|---|---|---|---|---|
| *Marital status* |  |  |  |  |  | 1,2,3,4 |
| Married (base) | 37.93 | 64.38 | 55.26 | 64.84 | 56.32 |  |
| Single female | 39.66 | 25.63 | 18.42 | 22.31 | 19.54 |  |
| Single male | 22.41 | 10 | 26.32 | 12.85 | 24.14 |  |
| *Homeownership Status* |  |  |  |  |  | 4,6,7,8,9,10 |
| Own home (base) | 79.31 | 83.75 | 89.47 | 75.43 | 64.37 |  |
| Do not own home | 20.69 | 16.25 | 10.53 | 24.57 | 35.63 |  |
| *Region* |  |  |  |  |  | 2 |
| West | 22.41 | 17.5 | 13.16 | 23.82 | 25.29 |  |
| Midwest | 34.48 | 36.88 | 31.58 | 24.57 | 20.69 |  |
| Northeast (base) | 22.41 | 15 | 18.42 | 17.39 | 14.94 |  |
| South | 20.69 | 30.63 | 36.84 | 34.22 | 39.08 |  |
| *Stock ownership* |  |  |  |  |  | 3,10 |
| Own stock (base) | 53.7 | 65.38 | 67.57 | 71.46 | 55.17 |  |
| Do not own stock | 46.3 | 34.62 | 32.43 | 28.54 | 44.83 |  |
| *Attitudes* |  |  |  |  |  |  |
| *Security and privacy* |  |  |  |  |  | 1,2,3,4,5,6,8,10 |
| Low | 68.75 | 55.06 | 35.29 | 25.05 | 54.65 |  |
| Medium (base) | 25 | 34.81 | 44.12 | 42.69 | 26.74 |  |
| High | 6.25 | 10.13 | 20.59 | 32.26 | 18.6 |  |
| *Convenience* |  |  |  |  |  | 1,2,3,4,6,7,8,10 |
| Low | 65.31 | 47.17 | 40 | 13.45 | 27.91 |  |
| Medium (base) | 30.61 | 40.25 | 42.86 | 29.55 | 43.02 |  |
| High | 4.08 | 12.58 | 17.14 | 57.01 | 29.07 |  |
| *Familiarity and ease of use* |  |  |  |  |  | 1,2,3,4,7,8,10 |
| Low | 35.29 | 7.59 | 14.29 | 2.65 | 12.79 |  |
| Medium (base) | 56.86 | 71.52 | 51.43 | 44.51 | 46.51 |  |
| High | 7.84 | 20.89 | 34.29 | 52.84 | 40.7 |  |

\* significant difference at 0.10 or better between:

1 = technophobes and prepaid-underbanked, 2 = technophobes and convenience seekers, 3 = technophobes and technophiles, 4 = technophobes and ATM/debit-underbanked, 5 = prepaid-underbanked and convenience seekers, 6 = prepaid-underbanked and technophiles, 7 = prepaid-underbanked and ATM/debit-underbanked, 8 = convenience seekers and technophiles, 9 = convenience seekers and ATM/debit-underbanked, 10 = technophiles and ATM/debit-underbanked

There was a strong contrast between the median ages of the technophobes and technophiles, with a 22 year gap between the two groups (a median age of 64 for the technophobes compared with 42 for technophiles). The other groups were not statistically different with respect to age. A higher proportion of technophobes had lower education levels than the other groups, with 52% of them not continuing their education beyond high school compared with 22% for technophiles and convenience seekers and 41% for the ATM/debit underbanked group.

In general, the convenience seekers and technophobe clusters had the highest proportion of white respondents; there were no Hispanics in these groups. Relative to other clusters, there were higher proportions of minorities in the technophile and ATM/debit underbanked groups. Single females were heavily represented among the technophobes (39%), while single males were least likely to be prepaid-underbanked than any other type of users. Married households were most likely to be technophiles or under-banked prepaid and were least likely to be

technophobes. Married and single-male households were more likely to be convenience seekers than single-female headed households. It is interesting to note, that ATM/debit underbanked users were least likely to own a house than any other users, while the convenience seekers cluster had the highest proportion of home owners. Technophobes were more likely to be from the Northeast than other users, while convenience seekers were less likely to live in the West than any other region. Lastly, lower proportions of technophobes and ATM/debit underbanked users owned stock than households in other clusters.

Attitudinal characteristics. In general, technophobes had the lowest ratings for security and privacy of the electronic payment systems, while technophiles and convenience seekers had higher ratings, as might be expected. Technophiles appear to consider the electronic payment systems to be highly convenient (57%); interestingly, only 17% of convenience seekers rate convenience of the electronic payment system as high. Not surprisingly, the technophile group had the highest proportion of users that were familiar with EPS and found it easy to use (53%) while the technophobe group had the lowest proportion of users reporting that EPS were familiar to them and were easy to use (8%).

Multinomial Logit Results

In order to explore the factors that influence the combinations of payment choices consumers utilize, we used a multinomial logit model with technophiles as the base category. The results from the regression are reported in Table 3.

Table 3.
Multiple Logistic Regression Coefficients (p-values in parens)

| | Technophobes/ Technophiles | Prepaid-underbanked/ Technophiles | Convenience seekers/ Technophiles | ATM/debit-underbanked/ Technophiles |
|---|---|---|---|---|
| *Household Income* | | | | |
| 2nd quintile | -0.575 ( 0.13) | 0.109 (0.56) | 0.386 (0.42) | 0.083 (0.72) |
| 3rd quintile | -0.380 ( 0.10) | -0.012 (0.93) | 0.355 (0.23) | 0.257 (0.09) |
| 4th quintile | -0.124 ( 0.52) | -0.020 (0.85) | 0.145 (0.55) | 0.203 (0.10) |
| 5th quintile | -0.077 (0.62) | -0.019 ( 0.84) | 0.202 (0.30) | 0.056 (0.63) |
| *Age* | | | | |
| Less than or equal to 35 | -1.038 ( 0.22) | -0.247 (0.44) | -1.367 (0.09) | -0.043 (0.91) |
| 60 and over | 0.649 ( 0.15) | 0.509 (0.05) | 0.408 (0.38) | 1.289 (0.00) |
| *Education* | | | | |
| Some college | -1.438 ( 0.05) | -0.374( 0.24) | 0.607 (0.28) | -0.376 (0.30) |
| Bachelor's degree | -0.893 (0.13) | -0.673 (0.03) | 0.429 (0.44) | -1.028 (0.01) |
| More than Bachelor's | -0.374 ( 0.52) | -0.322 (0.33) | -1.753 (0.12) | -0.583 (0.18) |
| *Race/Ethnicity of the respondent* | | | | |
| Black | -0.108 (0.91) | -0.233 ( 0.63) | -0.390 (0.72) | 0.006 (0.99) |
| Hispanic | -30.70 (1.00) | -0.947 (0.15) | -31.48 (1.00) | -0.334 (0.54) |
| Other | -0.286 (0.82) | -0.361 ( 0.60) | -31.93 (1.00) | 0.357 (0.54) |
| *Marital status of the respondent* | | | | |
| Single female | 1.119 ( 0.05) | 0.139 (0.65) | -0.479 (0.51) | -0.679 (0.10) |
| Single male | 1.556 ( 0.01) | 0.121 (0.74) | 1.390 (0.01) | 0.877 (0.01) |
| *Homeownership Status* | | | | |
| Own home | 0.858 ( 0.13) | 0.279 (0.38) | 0.681 (0.34) | -0.702 (0.04) |
| *Region* | | | | |
| Midwest | 0.242 ( 0.67) | 0.600 (0.08) | 0.187 (0.74) | 0.055 (0.91) |
| West | -0.411 ( 0.53) | -0.242 (0.53) | -0.565 (0.43) | 0.069 (0.88) |
| South | -1.253 ( 0.07) | -0.015 (0.97) | -0.285 (0.64) | 0.353 (0.42) |
| *Stock ownership* | | | | |
| Own stock | -0.335 ( 0.52) | -0.120 (0.66) | -0.388 (0.43) | -0.647 (0.04) |

| | Technophobes/ Technophiles | Prepaid- underbanked/ Technophiles | Convenience seekers/ Technophiles | ATM/debit- underbanked/ Technophiles |
|---|---|---|---|---|
| *Attitudes* | | | | |
| *Security and privacy* | | | | |
|   Low | 1.291 ( 0.02) | 0.326 (0.20) | -0.730 (0.15) | 0.761 (0.02) |
|   High | 0.632 (0.43) | -0.418 (0.26) | -0.071 (0.90) | 0.416 (0.30) |
| *Convenience* | | | | |
|   Low | 0.319 (0.51) | 0.350 (0.20 ) | 0.566 (0.29) | -0.137 (0.72) |
|   High | -1.765 (0.04) | -1.312 ( 0.26) | -1.551 (0.01) | -0.742 (0.04) |
| *Familiarity and ease of use* | | | | |
|   Low | -1.505 (0.01) | 0.133 (0.79) | 1.040 (0.17) | 1.404 (0.01) |
|   High | -1.527 (0.02) | -0.665 (0.01) | -0.100( 0.84) | 0.325 (0.28) |
| | | | | |
| Log likelihood | -659.8 | | | |
| Prob. (based on $\chi^2$) | 0.000 | | | |
| Pseudo $R^2$ | 0.21 | | | |

Because the multinomial logit parameter estimates are not particularly "reader friendly" when interpreting the effects of the independent variables across cluster membership, we calculated the probabilities of cluster membership associated with each independent variable for each observation (Greene, 1998). Statistical analysis programs such as Stata not only estimate the multinomial regression but also provide predicted probabilities, which are more easily interpreted than parameter coefficients. To simplify the discussion of results, we will not go into the details of the coefficients from the multinomial logistic regression. We will focus instead our discussion on the predicted probabilities of being in each of the five clusters for the significant independent variables (by definition, the probabilities across all clusters sum to 1). This will allow us to identify more clearly how particular characteristics are associated with consumers' payment choices.

In general, all of the variables except for race/ethnicity were significant at the 10% level for at least one, if not several, of the clusters.

Probability Estimates

Overall, the models' average predicted probability of a household being a technophobe was .047 (compared with the actual value of .067, Table 4). The predicted probability of a household being in the prepaid-underbanked group was .176 (compared with .185), the predicted probability of a user being a convenience seeker was .059 (compared with .044), the predicted probability of a household being a technophile was .635 (compared with .607) and the predicted probability of a household being in a ATM/debit underbanked group was .103 (compared with .099). The predicted probabilities for prepaid underbanked, technophiles, and ATM/debit underbanked users were within 10% of the actual value; the probabilities of technophobes and convenience seekers were under-predicted and over-predicted, respectively.

Socioeconomic and Demographic Characteristics. As might be expected, the probability of being in the technophile group rose with income. Households in the lowest income quintile had a .13 probability of being in the technophobe group, and a .53 probability of being the technophile group. In comparison, households in the middle quintile had a .03 probability of being in the technophobe group and a .61 probability of being in the technophile group.

Also as expected, age was inversely related to being in the technophile group. Households under age 35 had a .79 probability of being in the technophile group but only a .01 probability of being a convenience seeker. In contrast, households over age 60 had a .44 probability of being in the technophile group, a .26 probability of being in the prepaid-underbanked group and a .17 probability of being in the ATM/debit-underbanked group.

Generally, higher levels of education were associated with a higher probability of being in the technophile group. Households with a high school diploma or less had a .50 probability of being in the technophile group, a .24 probability of being in the prepaid-underbanked group, a .14 probability of being in the ATM/debit-underbanked group, and a .09 probability of being in the technophobe group. Households with some college had a .66 probability of being in the technophile group and only a .02 probability of being in the technophobe group. Those households

with a bachelor's degree had a .73 probability of being in the technophile group and only a .13 or .07 probability of being in the prepaid-underbanked or ATM/debit-underbanked groups, respectively.

Table 4.
Simulated Probabilities for Cluster Membership

| | Probability of being a technophobe | Probability of being Prepaid-underbanked | Probability of being a convenience seeker | Probability of being a technophile | Probability of being ATM/Debit-underbanked |
|---|---|---|---|---|---|
| Actual | 0.067 | 0.185 | 0.044 | 0.607 | 0.099 |
| Predicted | 0.047 | 0.176 | 0.059 | 0.635 | 0.103 |
| *Household Income* | | | | | |
| 1st quintile | 0.132* | 0.217 | 0.016 | 0.527* | 0.109* |
| 2nd quintile | 0.023 | 0.196 | 0.030 | 0.647 | 0.105 |
| 3rd quintile | 0.028* | 0.175 | 0.057 | 0.610* | 0.130* |
| 4th quintile | 0.030 | 0.163 | 0.036 | 0.663* | 0.108* |
| 5th quintile | 0.039 | 0.141 | 0.051 | 0.712 | 0.058 |
| *Age of Respondent* | | | | | |
| Less than or equal to 35 | 0.011 | 0.110 | 0.011* | 0.786* | 0.082 |
| Between 35 and 59 | 0.039 | 0.158* | 0.048* | 0.682* | 0.073* |
| 60 and over | 0.089 | 0.259* | 0.049 | 0.438* | 0.165* |
| *Education of respondent* | | | | | |
| High school diploma or less | 0.089* | 0.243* | 0.031 | 0.500* | 0.137* |
| Some college | 0.017* | 0.149 | 0.057 | 0.657* | 0.120 |
| Bachelor's degree | 0.028 | 0.126* | 0.056 | 0.726* | 0.065* |
| More than Bachelor's | 0.048 | 0.179 | 0.007 | 0.683 | 0.083 |
| *Race/Ethnicity of the respondent* | | | | | |
| White | 0.052 | 0.190 | 0.046 | 0.616 | 0.096 |
| Black | 0.040 | 0.140 | 0.020 | 0.680 | 0.120 |
| Hispanic | 0.000 | 0.065 | 0.000 | 0.804 | 0.130 |
| Other | 0.035 | 0.103 | 0.000 | 0.690 | 0.172 |
| *Marital status of the respondent* | | | | | |
| Married | 0.029* | 0.183 | 0.040* | 0.650* | 0.099* |
| Single female | 0.062* | 0.124 | 0.071 | 0.566* | 0.177* |
| Single male | 0.087* | 0.192 | 0.017* | 0.640* | 0.064* |
| *Homeownership Status* | | | | | |
| Own home | 0.050 | 0.187 | 0.046 | 0.629* | 0.088* |
| Do not own home | 0.039 | 0.140 | 0.017 | 0.654* | 0.151* |
| *Region* | | | | | |
| West | 0.041 | 0.134 | 0.023 | 0.680 | 0.122 |
| Midwest | 0.074 | 0.244* | 0.051 | 0.553* | 0.078 |
| Northeast | 0.065* | 0.163* | 0.057 | 0.634* | 0.081 |
| South | 0.020* | 0.153 | 0.032 | 0.675* | 0.121 |
| *Stock ownership* | | | | | |
| Own stock | 0.035 | 0.172 | 0.041 | 0.671* | 0.082* |
| Do not own stock | 0.073 | 0.186 | 0.036 | 0.561* | 0.145* |

| | Probability of being a technophobe | Probability of being Prepaid-underbanked | Probability of being a convenience seeker | Probability of being a technophile | Probability of being ATM/Debit-underbanked |
|---|---|---|---|---|---|
| *Attitude* | | | | | |
| *Security and privacy* | | | | | |
| Low | 0.096* | 0.274 | 0.033 | 0.448* | 0.148* |
| Medium | 0.024* | 0.158 | 0.050 | 0.695* | 0.074* |
| High | 0.016 | 0.067 | 0.031 | 0.803 | 0.083 |
| *Convenience* | | | | | |
| Low | 0.131 | 0.331 | 0.069 | 0.354 | 0.114 |
| Medium | 0.042* | 0.218 | 0.046* | 0.569* | 0.126* |
| High | 0.006* | 0.059 | 0.019* | 0.840* | 0.077* |
| *Familiarity and ease of use* | | | | | |
| Low | 0.209* | 0.209 | 0.093 | 0.256* | 0.233* |
| Medium | 0.062* | 0.246* | 0.041 | 0.558* | 0.093* |
| High | 0.009* | 0.091* | 0.030 | 0.773* | 0.097 |

*Statistically significant at a 10 % or better

Married households had a higher probability of being in the technophile group than their unmarried counterparts. Single males had a higher probability of being in the technophobe group than their counterparts, while single females had a higher probability of being in the ATM/debit-underbanked group.

Home owners had a .63 probability of being in the technophile group, compared with a .65 probability for non-owners. On the other hand, non-owners had a .15 probability of being in the ATM/debit-underbanked group compared with a .09 probability for owners.

Households in the Midwest had a .55 probability of being in the technophile group and a .24 probability of being in the prepaid-underbanked group. Households in the Northeast had a .63 probability of being in the technophile group, a .16 probability of being in the prepaid-underbanked group, and a .07 probability of being in the technophobe group. Households in the South had a .68 probability of being in the technophile group and only a .02 probability of being in the technophobe group.

Households that owned stock were more likely to be technophiles than their non-owning counterparts, as might be expected. Similarly, households that did not own stock had a higher probability of being in the ATM/debit-underbanked group than those that did (.15 versus .08, respectively).

Attitudinal Characteristics. The e-banking perception indexes provided some interesting results. Households that thought that electronic payment systems were not safe or secure had a 10% chance of being technophobes, a 15% chance of being under-banked ATM/debit users, and a 45% chance of being in the technophile group. On the other hand, households that gave moderate ratings to security and privacy had a 2% chance of being a technophobe, a 7% chance of being in the ATM/debit-underbanked group, and a 70% chance of being a technophile.

Households that thought that EPS were moderately convenient had a 4% chance of being in the technophobe or convenience seeker groups, a 13% chance of being in the ATM/debit-underbanked group, and a 57% chance of being in the technophile group. Households that rated EPS as highly convenient had less than 1% chance of being a technophobe, a 2% chance of being in the convenience seeker group, an 8% chance of being in the ATM/debit-underbanked group, and an 84% chance of being a technophile.

Low level of familiarity with EPS as well as perceiving that these payment services were more difficult to use were associated with a lower probability of being in the technophile group, as might be expected. Households that gave low ratings for familiarity and ease of use had a 21% chance of being technophobes, 23% chance of being in the ATM/debit underbanked group, and a 26% chance of being in the technophile group. Households that gave medium ratings for familiarity and ease of use had a 6% chance of being a technophobe, a 9% chance of being in the ATM/debit-underbanked group, a 25% chance of being in the prepaid-underbanked group, and a 56% chance of being in the technophile group. Households who gave high ratings to familiarity and ease of use of EPS were the most likely to be in the technophile group (77%); they had a 9% chance of being in the prepaid-underbanked group and less than a 1% chance of being in the technophobe group.

These findings suggest that consumers' attitudes and perceptions of e-banking, in terms of the three areas measured, are strongly associated with the types of technologies they will use. To these consumers, perception is reality.

### Discussion and Conclusions

The goal of this study was to explore the combinations of payment choices consumers use and to identify some of the characteristics of groups of consumers that fall within those choice sets. We recognize that our study is limited by the payment choices available in the data, and that we are missing at least three major payment options – cash, checks, and credit cards. We also recognize that we have no information on the number of transactions or the dollar value of those transactions. Such data would provide some valuable insights into consumers' decision-making. Nonetheless, the current study helps to shed some light on the consumer characteristics associated with different payment choices.

Our results confirm much of the work in the "adoption of technology" literature, in that younger, married, more highly educated, higher income, higher asset households were more likely to be in the technophile group, adopting many of the electronic payment choices included in the data. Similarly, older, single-headed, less-educated, lower income households were less likely to use the payment technologies included in the study.

Among the demographic characteristics, the effects of age are worth noting. There is a 35 point spread between the predicted probability of being a technophile for the under 35-year-old group (79%) and the 60 and over group (44%). It would be interesting to explore the sources of this difference – is this difference based on access to electronic payment systems, pricing of EPS services, lack of familiarity or understanding of how electronic payment systems work, concerns about security, or mere persistence of habit? Both financial institutions and community based organizations that work with seniors may want to explore these issues within their customer base and community to better understand and address their concerns.

Importance of Attitudes

But perhaps more importantly, our results confirm the importance of attitudes in the adoption of different types of payment technologies. Improving consumers' confidence in the security and privacy of various EPS technologies could bring about large increase in their use. For example, moving from a low to a medium rating could lead to a 25 basis point increase (from 45% to 70%) in the probability of using all of the technologies in our study. Financial institutions may want to consider ways to stress the security and privacy aspects of their electronic payment services to bolster consumer attitudes, although we recognize that this is a challenge when identity theft, phishing, and pharming continue to be in the news.

Similarly, changing consumer attitudes about the convenience of payment technologies could help bolster use of these technologies. Moving people from a medium to a high rating of convenience could be associated with a 27 basis point increase (from 57% to 84%) in the probability of adopting a wider range of technologies. Both financial institutions and community-based educators can help consumers identify ways that electronic payments can make bill paying more convenient. For example, institutions and educators may want to point out how electronic payments assure that bills are paid on time, thus eliminating late fees.

The aspects of familiarity and ease of use are associated with the largest potential increases in adoption of technologies in this study. Helping people access and become more familiar with these technologies and demonstrating the ease of use could lead to as much as a 51 basis point increase (from 26% to 77%) in the probability of adopting a larger set of these technologies.

Policy Issues

At the outset we discussed the fact that policy makers want to know how to adapt consumer protection laws to account for the wider range of payment choices in the market place. Our study found that a large proportion – three-fifths – of consumers use a wide range of payment techniques. Thus, a holistic approach to policy development and regulation that provides consistent protections for this wide range of payment choices may be needed. It may be possible to harmonize regulations governing ATM and debit cards, automatic bill payments, phone and PC banking, stored value cards, and possibly even credit cards to provide both consistent protections for consumers and consistent compliance guidelines for financial institutions.

Conclusions

The financial services marketplace and the available payment technologies continue to evolve. In response, consumers select bundles of electronic payment and account management services to meet their needs. These technologies hold the promise of helping families manage their cash flow and pay their bills on time. To take full

advantage of these technologies, however, consumers need to be familiar with the evolving array of options and choices, and to decide how different combinations of payment choices fit with their financial management needs. Financial institutions, policy makers, and community-based educators can all work together to help this potential become a reality.

## Appendix

Individual Attitude Questions, by Cluster Group (percent distributions)*

|  | Technophobe | Prepaid-underbanked | Convenience seekers | Technophiles | ATM/debit-underbanked |
|---|---|---|---|---|---|
| **Security and Privacy** |  |  |  |  |  |
| *When I use electronic banking my money is as safe as when I use other banking systems* |  |  |  |  |  |
| Strongly disagree | 10.87 | 4.55 | 6.06 | 2.49 | 6.98 |
| Disagree | 45.65 | 30.52 | 24.24 | 18.36 | 25.58 |
| Neutral | 15.22 | 22.08 | 12.12 | 16.06 | 13.95 |
| Agree | 26.09 | 41.56 | 42.42 | 53.35 | 41.86 |
| Strongly agree | 2.17 | 1.3 | 15.15 | 9.75 | 11.63 |
| *I feel comfortable providing my personal information when using electronic banking systems* |  |  |  |  |  |
| Strongly disagree | 15.22 | 20.38 | 14.71 | 7.63 | 16.47 |
| Disagree | 63.04 | 47.77 | 29.41 | 26.72 | 32.94 |
| Neutral | 6.52 | 12.1 | 14.71 | 15.27 | 12.94 |
| Agree | 13.04 | 16.56 | 26.47 | 45.61 | 30.59 |
| Strongly agree | 2.17 | 3.18 | 14.71 | 4.77 | 7.06 |
| *I worry about the privacy of my information when using electronic banking systems* |  |  |  |  |  |
| Strongly agree | 22.92 | 18.18 | 20.59 | 15.18 | 22.09 |
| Agree | 62.5 | 57.79 | 47.06 | 41.37 | 44.19 |
| Neutral | 4.17 | 9.09 | 8.82 | 12.14 | 6.98 |
| Disagree | 6.25 | 12.34 | 17.65 | 28.27 | 22.09 |
| Strongly disagree | 4.17 | 2.6 | 5.88 | 3.04 | 4.65 |
| *Mistakes are more likely to occur with electronic banking than with regular banking* |  |  |  |  |  |
| Strongly agree | 20 | 8.92 | 8.82 | 3.63 | 11.9 |
| Agree | 44.44 | 40.76 | 26.47 | 22.75 | 41.67 |
| Neutral | 13.33 | 24.2 | 32.35 | 17.59 | 13.1 |
| Disagree | 20 | 24.2 | 20.59 | 51.82 | 30.95 |
| Strongly disagree | 2.22 | 1.91 | 11.76 | 4.21 | 2.38 |
| *Mistakes with electronic banking are more difficult to get corrected than with regular banking* |  |  |  |  |  |
| Strongly agree | 15.91 | 10.53 | 11.76 | 7.46 | 18.6 |
| Agree | 45071 | 51.97 | 35.29 | 32.7 | 44.19 |
| Neutral | 13.64 | 19.08 | 38.24 | 24.28 | 13.95 |
| Disagree | 13.64 | 17.76 | 11.76 | 33.27 | 22.09 |
| Strongly disagree | 0 | 0.66 | 2.94 | 2.29 | 1.16 |
| *I worry that electronic banking systems are not secure enough and I could loose my money* |  |  |  |  |  |
| Strongly disagree | 13.33 | 10.39 | 15.15 | 6.46 | 11.76 |
| Disagree | 51.11 | 51.3 | 30.3 | 24.52 | 35.29 |
| Neutral | 15.56 | 14.94 | 21.21 | 16.54 | 12.94 |
| Agree | 20 | 20.78 | 33.33 | 47.72 | 32.94 |
| Strongly agree | 0 | 2.6 | 0 | 4.75 | 7.06 |

*Responses are ordered so that least "favorable to e-banking" is listed first and most "favorable to e-banking" is listed last

| | Technophobe | Prepaid-underbanked | Convenience seekers | Technophiles | ATM/debit-underbanked |
|---|---|---|---|---|---|
| **Convenience** | | | | | |
| *There are enough advantages of electronic banking for me to consider using it* | | | | | |
| Strongly agree | 19.57 | 11.95 | 8.82 | 3.03 | 8.24 |
| Agree | 45.65 | 42.14 | 38.24 | 17.23 | 27.06 |
| Neutral | 13.04 | 15.09 | 5.88 | 10.04 | 10.59 |
| Disagree | 21.74 | 27.04 | 29.41 | 47.73 | 40 |
| Strongly disagree | 0 | 3.77 | 17.65 | 21.97 | 14.12 |
| *Electronic banking is convenient* | | | | | |
| Strongly disagree | 8.7 | 4.46 | 5.88 | 0.76 | 1.19 |
| Disagree | 21.74 | 13.38 | 5.88 | 4.17 | 13.1 |
| Neutral | 15.22 | 15.29 | 11.76 | 6.68 | 4.76 |
| Agree | 47.83 | 57.32 | 58.82 | 59.09 | 60.71 |
| Strongly agree | 6.52 | 9.55 | 17.65 | 29.36 | 20.24 |
| *It bothers me to use a machine for banking transactions when I could talk with the person instead* | | | | | |
| Strongly agree | 24.44 | 22.93 | 14.71 | 7.39 | 20 |
| Agree | 62.22 | 47.13 | 55.88 | 24.43 | 36.47 |
| Neutral | 0 | 11.46 | 11.76 | 12.31 | 7.06 |
| Disagree | 13.33 | 15.29 | 14.71 | 45.83 | 32.94 |
| Strongly disagree | 0 | 3.18 | 2.94 | 10.04 | 3.53 |
| *Electronic banking helps me to better manage my personal finances* | | | | | |
| Strongly agree | 11.63 | 4.49 | 11.76 | 1.71 | 9.41 |
| Agree | 53.49 | 44.23 | 38.24 | 19.81 | 30.59 |
| Neutral | 16.28 | 31.41 | 20.59 | 17.9 | 21.18 |
| Disagree | 18.6 | 16.67 | 20.59 | 43.43 | 31.76 |
| Strongly disagree | 0 | 3.21 | 8.82 | 17.14 | 7.06 |
| **Familiarity and Ease of Use** | | | | | |
| *Electronic banking is the wave of the future* | | | | | |
| Strongly disagree | 6.38 | 1.27 | 2.86 | 2.09 | 2.33 |
| Disagree | 17.02 | 12.66 | 8.57 | 4.18 | 9.3 |
| Neutral | 14.89 | 12.03 | 8.57 | 5.51 | 12.79 |
| Agree | 46.81 | 58.86 | 57.14 | 55.89 | 55.81 |
| Strongly agree | 14.89 | 15.19 | 22.86 | 32.32 | 19.77 |
| *Electronic banking services are used by many people* | | | | | |
| Strongly disagree | 2.04 | 1.27 | 0 | 0.76 | 1.18 |
| Disagree | 12.24 | 7.59 | 17.14 | 6.08 | 5.88 |
| Neutral | 10.2 | 11.39 | 8.57 | 7.79 | 10.59 |
| Agree | 65.31 | 65.19 | 57.14 | 64.64 | 70.59 |
| Strongly agree | 10.2 | 14.56 | 17.14 | 20.72 | 11.76 |
| *I have seen how others use electronic banking* | | | | | |
| Strongly disagree | 12.77 | 5.88 | 5.71 | 2.68 | 3.66 |
| Disagree | 25.53 | 24.18 | 25.71 | 15.13 | 21.95 |
| Neutral | 21.28 | 16.99 | 14.29 | 12.84 | 10.98 |
| Agree | 38.3 | 47.71 | 42.86 | 53.26 | 50 |
| Strongly agree | 2.13 | 5.23 | 11.43 | 16.09 | 13.41 |

| | Technophobe | Prepaid-underbanked | Convenience seekers | Technophiles | ATM/debit-underbanked |
|---|---|---|---|---|---|
| *I have the opportunity to try various electronic banking services* | | | | | |
| Strongly disagree | 6.52 | 5.73 | 5.71 | 2.85 | 4.71 |
| Disagree | 39.13 | 28.66 | 20 | 13.12 | 23.53 |
| Neutral | 2.17 | 11.46 | 8.57 | 5.13 | 10.59 |
| Agree | 45.65 | 49.04 | 48.57 | 59.51 | 48.24 |
| Strongly agree | 6.52 | 5.1 | 17.14 | 19.39 | 12.94 |
| *I need to familiarize myself with electronic banking technology* | | | | | |
| Strongly disagree | 12.24 | 6.33 | 11.76 | 4.55 | 4.65 |
| Disagree | 42.86 | 34.18 | 26.47 | 25.81 | 26.74 |
| Neutral | 6.12 | 15.19 | 11.76 | 13.09 | 10.47 |
| Agree | 28.57 | 32.28 | 35.29 | 43.07 | 41.86 |
| Strongly agree | 10.2 | 12.03 | 14.71 | 13.47 | 16.28 |
| *Electronic banking is difficult to use* | | | | | |
| Strongly agree | 4.76 | 5.84 | 15.15 | 11.07 | 14.12 |
| Agree | 52.38 | 14.29 | 15.15 | 10.31 | 24.71 |
| Neutral | 4.76 | 35.06 | 15.15 | 17.18 | 25.88 |
| Disagree | 38.1 | 44.81 | 54.55 | 61.45 | 35.29 |
| Strongly disagree | 0 | 0 | 0 | 0 | 0 |

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