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How do speed and security influence consumers' payment behavior?

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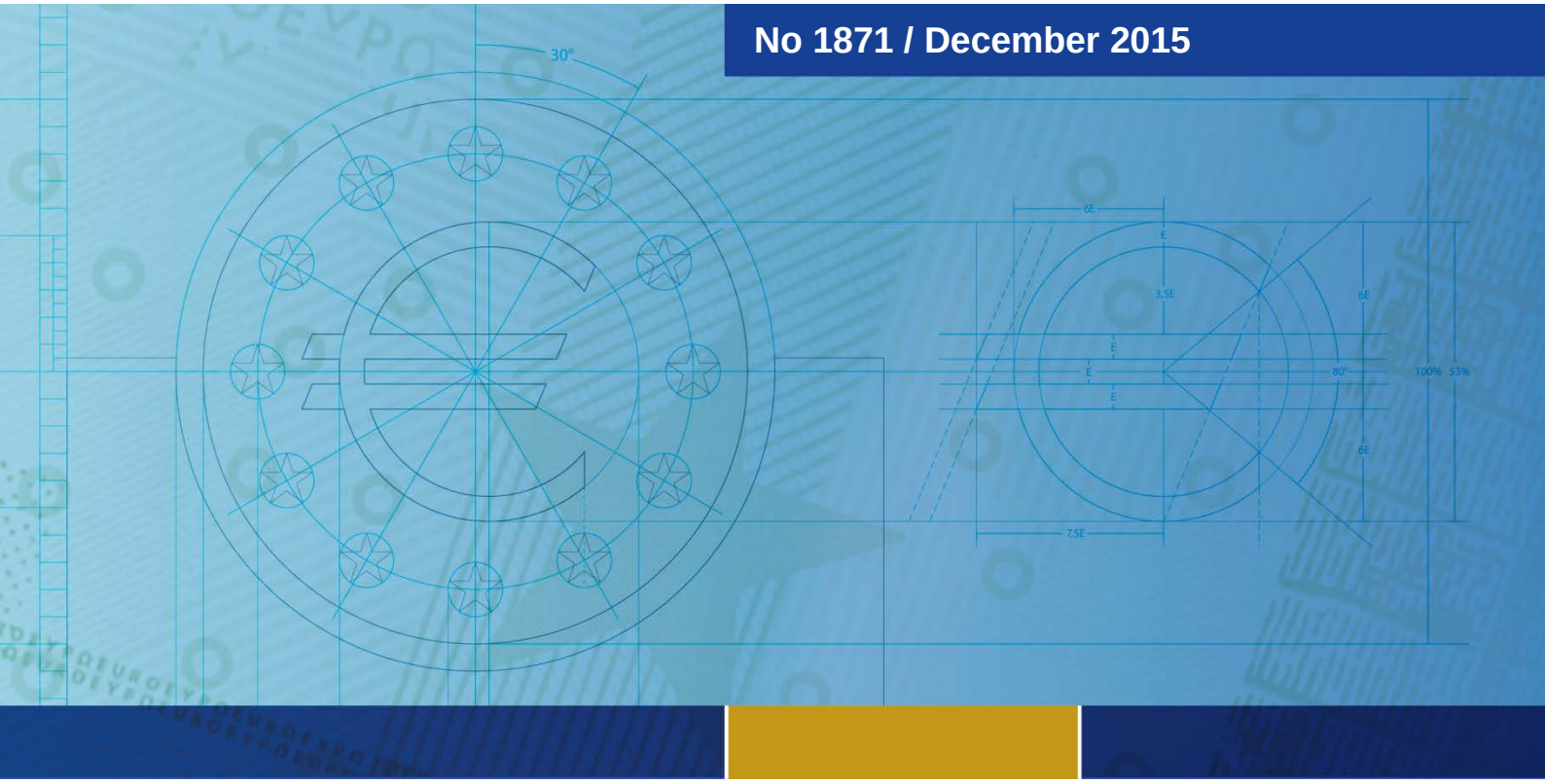

Getting the balance right: innovation, trust and regulation in retail payments

Biennial retail payments conference
Organised by the European Central Bank and Suomen Pankki

This paper was submitted and accepted for the biennial retail payments conference titled “Getting the balance right: innovation, trust and regulation in retail payments”. The conference, jointly organised by the European Central Bank and Suomen Pankki, was held on 4 and 5 June 2015 in Helsinki. Its aim was to identify possible developments and dynamics that will shape the future retail payments landscape and to provide a forum for debate among market participants, policy-makers, regulators and researchers.

In Europe, harmonised SEPA payment instruments have recently replaced national credit transfers and direct debits, resulting in billions of monthly payments now being based on the same business and technical standards. Two important EU legislative initiatives – the revised Payment Services Directive and the regulation on interchange fees – will continue to affect the retail payments market, especially the card payment business and the market for innovative payment services. Another new piece of EU legislation, the Payment Accounts Directive, will bring about a high degree of price transparency in payment account services and aims to promote financial inclusion. Technological advances are driving the development of an increasing variety of services, including new person-to-person payment solutions and instant payment services for end users. New concepts of market structure and new types of business model are being discussed and could be put into practice.

All the above will have an impact on payment behaviour and payment methods used. It may raise new questions on how to ensure trust in retail payment schemes and systems. In addition, owing to regulatory and technical developments both in Europe and beyond, new players are entering the market, challenging the role of the incumbent payment service providers and their payment solutions. Furthermore, the continuous trend of globalisation and growing international trade has fostered the call for more efficient cross-border payment solutions. The conference provided the opportunity to discuss these issues, and their possible solutions, from both policy and academic perspectives.

The selection and refereeing process for this paper was carried out by the conference organisation committee, which comprises experts from both organising institutions. Papers were selected based on their quality and on the relevance of the research subject to the main themes of the event. Following the conference the authors of the selected papers were invited to revise their paper to take into consideration discussant feedback and other comments from the conference.

The paper is being published in order to disseminate the research work submitted to the conference to a wider audience. All the academic papers presented at the 2015 conference can be found at http://www.ecb.europa.eu/pub/conferences/html/150604_retpaym.en.html .

Abstract:
The Federal Reserve named improvements in the speed and security of the payment system as two of its policy initiatives for 2012–2016. Using new data from the 2013 Survey of Consumer Payment Choice (SCPC) and models from earlier research, we estimate how various aspects of speed and security influence consumers' decisions to adopt and use payment instruments. Some aspects of speed and security have a statistically significant influence on the adoption and use of selected payment instruments, but not as much as other characteristics of payment instruments. Using econometric models to simulate selected policies proposed by the Fed, we show that faster speed of payment deduction for Automatic Clearing House (ACH) transactions would slightly increase consumers' adoption of ACH-based payment methods, while enhanced security of payment cards would marginally increase the use of credit and debit cards. However, neither improvement is likely to increase consumer welfare much because consumer demand for payments is very inelastic with respect to speed and security. Our analysis focuses exclusively on consumers' behavior and does not include potential benefits of improvements to the payment system that would directly benefit businesses or financial institutions. In addition, preventing security breaches may preserve public confidence in the payment system, benefitting consumers even if they do not change their payment behavior.

JEL Classifications: D12, D14, E58

SUMMARY

In October 2012, the Federal Reserve issued its strategic plan for the 2012–2016 payments policy. The plan emphasized enhancing end-to-end speed, security, and efficiency as the most important initiatives for the payments policy in the next several years. This paper contributes to the body of research that may provide guidance in shaping these policy initiatives by using new data from the Federal Reserve Bank of Boston's annual Survey of Consumer Payment Choice (SCPC). The SCPC collects data from consumers on their assessments of payment instruments' characteristics, including speed and security, as well as cost, convenience, records, and setup. Economists have found some of these characteristics important in explaining why consumers adopt and use the payment instruments they do. Convenience and cost have been found to be especially strong factors affecting payment behavior, although record keeping and security have also significantly influenced the adoption and/or the use of selected payment instruments.

The previous market research on end users' preferences commissioned by the Federal Reserve does not provide sufficient guidance about how implementing relevant new policies would alter consumers' payment behavior and hence increase consumer welfare. We help to address this gap. In response to the Federal Reserve's new policy initiative, the 2013 SCPC included a detailed survey of consumers on their valuation of specific aspects of speed and security. Using this new data and models from earlier research, we estimate how specific aspects of speed and security influence consumers' decisions to adopt and use payment instruments. In particular, the survey inquires about four aspects of speed and three aspects of security: speed at time of payment, speed of payment deduction, speed of notification of balances, speed of recipient receiving payment, security of financial wealth, security of personally identifiable information, and security of information about payment transactions. These specific questions allow us to explore in greater detail which aspects of speed and security of payments consumers consider most important, and whether and how these payment characteristics affect consumers' payment behavior.

The paper yields several interesting results. We find that improved payment speed would slightly increase the adoption of some payment methods, while security enhancements

would be more likely to increase the use of others. Adoption of Automatic Clearing House (ACH)-based electronic payments is most likely to be influenced by increasing the speed of payments, while debit card and credit card use would increase with improved security. We expand upon these results by using econometric models to simulate selected policies proposed by the Federal Reserve, specifically those that would increase the speed of ACH transactions with respect to speed of payment deduction and speed of notification of balances and enhance the security of payment cards in safeguarding financial wealth. The results reveal that faster speed of payment deduction for ACH transactions would slightly increase consumers' adoption of ACH-based payment methods, while enhanced security of payment cards would marginally increase the use of credit and debit cards. However, **despite speed and security being statistically significant determinants of consumer payment choice, neither improvement is likely to increase consumer welfare in an economically significant way**. Consumer demand for payments is very inelastic with respect to speed and security, meaning that very large improvements in either speed or security would be needed to generate a noticeable increase in the adoption or use of these payment instruments. Our findings confirm that other attributes of payments—convenience, cost, and record keeping—have greater effects on consumer payment behavior.

However, we note that it is possible that consumer welfare might increase even if the improvements had little direct effect on consumer payment adoption or use. Our analysis focuses only on consumers and does not include any potential benefits to merchants, businesses, or financial institutions. If improved speed or security helped financial institutions reduce their costs, consumers might benefit indirectly. Similarly, a reduction in payment card fraud losses to banks and merchants would reduce the overall payment system cost, possibly leading to lower retail prices for consumers. Additionally, preventing security breaches might preserve public confidence in the payment system, benefitting consumers even if it does not change their payment choices. As such, the overall social benefits of the potential policies may be higher than the total cost, even without direct substantial impact on consumer payment choice.

I. Background

In October 2012, Federal Reserve Financial Services (FRFS) issued its strategic plan for 2012–2016. The strategic plan emphasized enhancing end-to-end speed, security, and efficiency as the most important initiatives for payments in the next several years, where end-to-end means that for the first time end users are explicitly included. Using industry input and the results of market research, the Federal Reserve released a followup paper, "Strategies for Improving the U.S. Payment System" in January 2015.[1]

The market research on end users' preferences commissioned by the Federal Reserve revealed that not all the features of speed and security are important and that none of these features is important to all consumers. While these findings are interesting, they do not provide sufficient guidance about how implementing relevant new policies would alter consumers' payment behavior and hence increase consumer welfare. This paper helps to address this gap.

Economists have studied the question of how some of the characteristics of payment instruments, such as speed and security, affect consumer decisions to adopt and use these payment instruments. Such characteristics have been found to be important in explaining why consumers adopt and use the payment instruments they do. Convenience and cost have been found to be especially strong factors affecting payment behavior, although record keeping and security have also significantly influenced the adoption and/or the use of selected payment instruments.[2]

To evaluate how potential improvements in speed or security would increase consumer welfare, the Consumer Payments Research Center at the Boston Fed conducted a detailed survey of consumers on their valuation of specific aspects of speed and security in 2013, as part of its annual Survey of Consumer Payment Choice (SCPC annual surveys, from 2008 to 2014).[3]

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[1] https://fedpaymentsimprovement.org/wp-content/uploads/strategies-improving-us-payment-system.pdf. Note that because the final strategy paper is currently under discussion by Federal Reserve policymakers, all the policies and strategies discussed here are preliminary.

[2] See Schuh and Stavins (2010, 2013), Ching and Hayashi (2010).

[3] See Schuh and Stavins (2014) for a more complete description of the SCPC survey in 2011–2012.

Using the results of the SCPC survey conducted in the fall of 2013 and the models of Schuh and Stavins (2010, 2013), this paper explores in greater detail which specific aspects of speed and security of payments consumers consider most important, and whether and how these payment characteristics affect consumers' payment behavior.

We find that improved payment speed would slightly increase the adoption of several payment methods, while security enhancements would be more likely to increase the use of specific payment instruments. Adoption of Automatic Clearing House (ACH)-based electronic payments—online banking bill payments (OBBP) and bank account number payments (BANP)[4]—is most likely to be influenced by increasing the speed of payments, while debit card and credit card use would increase with improved security in safeguarding financial wealth. We apply these results to simulate two specific policies: improving the speed of ACH-based payments and enhancing the security of payment cards in guarding against risks to financial wealth. We then assess the impact of these policies on consumer behavior. In the welfare analysis presented here, we focus on the benefits rather than the costs, although Greene et al. (2014) shows that the cost of implementing and operating faster payments is likely to be relatively low. On the other hand, the cost of increased card security, such as by broad adoption of the EMV (Europay, MasterCard, and Visa) standard would likely be much higher.

Although speed and security are statistically significant determinants of consumer payment choice, the likely effects of these characteristics on consumers is not economically significant. Instead, other attributes of payments—convenience, cost, and record keeping—have greater effects on consumer payment behavior. Our analysis focuses only on consumers and does not include any potential benefits to merchants, businesses, or financial institutions. If improved speed or security helped financial institutions reduce their costs, it is possible that consumers might benefit indirectly from such enhancements. We analyze the potential effects of speed and security improvements on consumer welfare through changes in consumer payment

[4] Online banking bill payment (OBBP) is a payment made from a bank's online banking website or online mobile app that accesses funds from a customer's checking or savings account to pay a bill or to pay other people. Bank account number payment (BANP) is a payment made by providing one's bank account number to a third party, such as one's employer or a utility company.

behavior. It is possible that consumer welfare might increase even if the improvements had little effect on consumer payment adoption or use, as we discuss in our concluding section.

II. FRFS Findings on Speed and Security

A comparison between the FRFS approach and the SCPC approach is detailed in the Appendix. This section briefly summarizes the FRFS study results.

A. Speed

The FRFS conducted market research to solicit end users' preferences and views on the importance of various payment features, including the speed of payment deduction, the speed of payment notification, and the confirmation of recipients' receipt of funds. The research combined small focus groups and a set of questions administered to a larger sample of consumers. The FRFS used a "discrete choice methodology" for evaluating attribute importance and consumer preferences. The questions included a set of specific real-life cases, where respondents were given a description of the type of payment and how long it would take to process a payment using various payment methods. Respondents were asked to choose a payment based on the description.

A summary of the FRFS findings related to speed reveals the following:[5]

- Respondents indicated that the speed of payment deduction is more important than the speed of a recipient's receiving payment;
- When presented with a choice of faster or slower payment deduction, 69 percent of consumers indicated a preference for faster payment deduction;
- 75 percent of consumers stated that timely payment notification is important.

Although the FRFS research found that payment speed is important to consumers, it is not the most important factor, a finding confirmed in the SCPC survey. The FRFS quantitative results on the extent to which improving payment speed would change consumer behavior

[5] http://fedpaymentsimprovement.org/wp-content/uploads/enduser_demand_summary.pdf

were limited and have not been published. The research did not provide a comprehensive analysis of consumer adoption or use. It was based on hypothetical situations rather than on revealed preference.

B. Security

The FRFS conducted the Payment Security Landscape Study[6] to understand end-to-end security needs. Although security enhancement was identified as a priority, there was no focus on any specific aspects, because the goal includes preventing any potential future threats. However, the protection of data was specifically mentioned.

III. Measuring the Speed and Security of Payment Instruments

Each year, the SCPC questionnaire asks its respondents to evaluate payment instruments according to a set of payment attributes (see Table 1 for a list of attributes included in each annual survey). Speed was included only in the initial SCPC in 2008, and the question asked consumers only to evaluate each payment instrument with respect to speed time at checkout. Because the assessment of speed time at checkout was found not to affect payment adoption and only weakly to affect the use of checks and prepaid cards (Schuh and Stavins 2013), the question about speed was dropped from subsequent versions of the SCPC.

In each annual SCPC between 2008 and 2012, consumers ranked security as the most important characteristic of payments. Security was also found to affect the adoption and use of some payment instruments (Stavins 2013). However, the security question included both possible financial loss and a loss of privacy. Based on the responses to the single security question, it is difficult to figure out which aspect of security matters most to consumers and how enhancing individual features would affect consumer adoption or use of specific payment instruments.

[6] http://fedpaymentsimprovement.org/wp-content/uploads/payment_security_landscape.pdf

In 2013, we added a set of detailed questions about speed and security in the annual SCPC survey to learn more about consumer preferences related to the FRFS strategic goals. In addition to the standard set of characteristics included in previous annual surveys, we asked about four, speed-related characteristics that match the FRFS speed aspects and three, security-related characteristics. Table 2 shows how we mapped the FRFS speed aspects into the SCPC questions. The exact SCPC survey questions are included below in italics.

A. Speed

The Federal Reserve Financial Services market research identified three aspects of speed:

- Transaction speed: The amount of time it takes to initiate the payment and receive confirmation (if confirmation is normally expected) that the payment has been successfully scheduled. This combines the speed at the time of payment and the speed of receiving notification when the payment leaves the payer's account.
- Availability speed: The amount of time that passes between when a payment is initiated and when funds are credited to the payee's account. This is the speed of the recipient's receipt of the money.
- Posting speed: How quickly the payer's account balance is debited after the payment is initiated. This is the speed with which payments are deducted from the payer's account.

In order to collect more information about how consumers value these aspects of speed, we selected the speed characteristics to match those included in the FRFS study. The following speed attributes were included in the 2013 Survey of Consumer Payment Choice:

1. Speed at time of payment

When you make a payment transaction, the time it takes to start and complete the payment may depend on the choice of payment method. Some payment methods might take less time than others. Please assess the speed of the payment transaction for each payment method.

2. Speed of payment deduction

When you make a payment transaction, a period of time may pass before the money is deducted from your bank account or prepaid card. Please assess the speed with which money is deducted from your bank account or prepaid card after you make a payment.

3. Speed of recipient receiving payment

When you make a payment transaction, a period of time may pass before the recipient of the payment (the payee) receives the money. Please assess the speed with which the recipient (the payee) gets the money for each payment method.

4. Speed of notification of balances

When you make a payment transaction, a period of time may pass before the payment is reported in the balance of your bank account or payment card. Please assess the speed with which you can see an up-to-date balance after the payment for each payment method.

B. Security

Although the FRFS did not list specific aspects of security, we focused on separating financial security from privacy. The former involves a risk of losing money, while the latter involves the risk of one's personal information being obtained by others without the target's consent. We also asked about confidentiality of information (or "anonymity") about the payment transaction itself:

1. Security of personally identifiable information

Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Please rate the security of each method against unwanted disclosure of personal information such as name, address, telephone number, Social Security number, date and place of birth, mother's maiden name, etc.

2. Security of financial wealth

Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Please rate the security of each method against permanent financial loss to the owner of the payment method.

3. Security of information about of payment transactions

Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Please rate the security of the confidentiality of each method against others finding out what products were purchased, how much was paid, or where the products were bought.

Survey respondents were asked to rate each of the above characteristics on an absolute scale of 1 to 5 for each payment instrument, where 1 was the least desirable (slowest or least secure) and 5 was the most desirable (fastest or most secure). In general, a lower rating for a particular payment method meant that a consumer considered that payment method to be inferior with respect to a given characteristic. Note that the numeric values represent qualitative ranking and do not reflect actual quantitative measures like time (seconds, minutes, days) or comprehensive details of actual measures (such as all aspects of cost). However, in theory and practice, consumers' ratings of the characteristics should be positively correlated with all of the actual characteristics. In previous research (Schuh and Stavins 2010, 2013) we found that consumer payment behavior is strongly influenced by relative characteristics, which measure a consumer's rating of a given payment method relative to all the other payment methods. For example, a consumer may rate the speed of credit cards at the time of payment as 4, but the speed of debit cards as 5. Although 4 is a high rating, that consumer may choose to use his debit card instead. Using relative ratings in the model allows us to measure how each of the characteristics influences which payment methods consumers adopt and use, and why they do so. Although some payment behavior is correlated with demographic attributes—for example, younger people are more likely to use debit cards, while older people are more likely to use checks—we found that a substantial amount of variation in payment behavior among consumers remains unexplained even when controlling for several demographic and financial variables. Incorporating payment characteristics allows us to explain some of the differences in how people pay.

All consumers rate each payment instrument, regardless of whether the consumer has adopted that instrument or not. Not all consumers have full information, and some may have very limited information. For example, non-adopters of a payment instrument may have very

limited information. (It is also possible that the non-adopters decided not to adopt a payment instrument *because* they had full information.) However, agents can form expectations or assessments even with limited information. The accumulation of information may be enhanced by adoption and use, but it may also be accumulated from other sources. Although consumer behavior may not be optimal because of his or her limited information and biased assessments, the assessments—biased or unbiased—are an important input into actual consumer decisions and behavior.[7]

Figures 1 and 2 show the numeric ratings for the speed and security characteristics, based on the 2013 SCPC survey. As the figures show, the ratings vary across the payment instruments and across the various aspects of speed or security. For example, cash is rated very low in terms of financial security, but very high in terms of the security of personal information. However, there are a few visible patterns. Several of the speed ratings in Figure 1 are mostly blue, while the security ratings in Figure 2 have less blue and more red, indicating that consumers tend to be more satisfied with the speed of payments than they are with the security of payments. Speed time at checkout was rated especially high—consistent with the FRFS findings. Speed time at checkout was also rated by consumers as more important than the other three aspects of speed.[8]

Consumers considered the security of payment methods more important than speed. When respondents were asked to rank the importance of the seven speed and security attributes of payments methods, all three aspects of security were ranked higher than any of the speed-related attributes (Table 3). Among the security characteristics, the security of financial wealth was ranked the highest. Among the speed characteristics, speed at the time of payment was ranked the highest (but below all the security measures), and the speed of the recipient's receipt of payment was ranked the lowest. Previous versions of the SCPC included a combined security

[7] We thank an anonymous referee for pointing out this important point.
[8] As an announymous referee pointed out, the speed of deduction for cash is different from the speed of deduction for other payment instruments. For cash, deduction precedes the actual transaction, as cash has to be withdrawn (and deducted) before the transaction takes place. Therefore the speed of deduction for cash is faster than for any other payment method. That feature of cash may be desirable for some consumers but not for others, which is why their ratings vary.

attribute, and it was consistently ranked as the most important characteristic (except in 2013, when it ranked as the second most important). Speed time at checkout was included only in 2008, when it ranked second-to-last in importance (Table 4). The correlation among the various aspects of speed and among the various aspects of security is not very strong: The correlation coefficients among the four aspects of speed ranged from 0.26 to 0.3, while the correlation coefficients among the three aspects of security ranged from 0.18 to 0.25. Therefore a person who rates the speed of time at checkout very highly may rate the speed of deduction very low or vice versa.

IV. Effects of Speed and Security on Payment Behavior

We estimate adoption and use of each payment instrument, where use is defined as the share of transactions conducted with each payment instrument. In our two-stage model, consumers first adopt a portfolio of payment instruments, such as debit cards, credit cards, cash, and checks. Adoption of payment methods is stage one and a prerequisite to use. Then, consumers choose how extensively to use each instrument. That is, consumers first decide which instruments to adopt, and then decide which of the ones they have adopted to use. We therefore estimate separately the effect of the explanatory variables on adoption, and then on use, conditional on adoption. We apply the Heckman (1976) selection model, which controls for potential selection bias in payment use.

In our model, adoption of a payment method is a function of various characteristics of the payment method, as well as demographic and financial attributes of the consumer. Consumers assess each of these characteristics for each payment method on a Likert scale of 1–5. These numerical assessments are then used to construct average relative characteristics, as described below.

Adoption of payment method *j* by consumer *i* is modeled as:

$$\Pr(A_{ij} = 1) = A(\overline{RCHAR}ij, X_i, Z_{ij}) + \varepsilon_{ij}^{A}, \quad (1)$$

where

$$A_{ij} \equiv \begin{cases} 1 & \text{if consumer } i \text{ has adopted payment instrument } j \\ 0 & \text{otherwise.} \end{cases}$$

$\overline{RCHAR_{ij}}$ is a vector of average characteristics of payment *j* relative to the characteristics of all other payment instruments for consumer *i* (created as described below); X_i is a vector of control variables for consumer *i* (demographic and financial variables such as age, gender, race, education, marital status, income, and net worth); Z_{ij} is a set of variables included in the adoption stage, but omitted from the use stage: acceptance, setup, homeownership, dummy variable indicating whether the respondent has EVER been bankrupt in last 12 months, dummy variable indicating whether the respondent has EVER been bankrupt in the last 7 years.[9]

Conditional on adoption of payment *j*, we model the use of each payment instrument *j* by consumer *i* as follows:

$$U_{ij} = U(\overline{RCHAR_{ij}}, X_i, NUM_{0i} \ldots NUM_{6i}, MR_i^{-1}) + \varepsilon_{ij}^{U}, \quad (2)$$

where $U_{ij} \equiv \left(n_{ij} / N_i\right)$ is the ratio of the number of payments consumer *i* made using payment *j* over the total number of payments made by consumer *i* in a month, or the share of all transactions made with payment instrument *j*, and $N_i \equiv \sum_j n_{ij}$ is the total number of payments made by consumer *i* using all payment instruments *j*; $\overline{RCHAR_{ij}}$ and X_i are defined as in equation (1); NUM_i is a set of dummy variables indicating how many other payment instruments consumer *i* has adopted;[10] and MR_i^{-1} is the inverse Mills Ratio from the first-stage Heckman probit model to control for simultaneity of the payment adoption and use decisions.

[9] In order for the Heckman model to be identified, some variables must be omitted from the 2nd (use) stage. Acceptance and setup are payment method characteristics that affect adoption, but are unlikely to affect use. Similarly, past bankruptcy is likely to affect whether a consumer gets certain payment methods, such as credit cards, but is less likely to have any effect on use.

[10] Because we measure the use of each payment *j* as a share of payments made using *j*, and not as the absolute number of payments, the shares are (by design) affected by the number of payment instruments adopted by the consumer.

Characteristics are rated on a 1–5 scale. We are interested in consumers' rating of each payment instrument j relative to all the other payment instruments j'. Therefore, for each characteristic k, we use log relative characteristics as explanatory variables,

$$RCHAR_{ki}(j, j') \equiv \log\left(\frac{CHAR_{kij}}{CHAR_{kij'}}\right),$$

where k indexes the characteristics: acceptance, cost, convenience, setup, and record keeping, plus all the aspects of speed and security; i indexes the consumer; and j is the payment instrument. In principle, all the relative characteristics could influence a consumer's choice of any payment instrument. However, to facilitate the interpretation of the marginal effects of the characteristics on use, we construct the average relative characteristic for each payment characteristic,

$$\overline{RCHAR}_{ki}(j) = \frac{1}{J}\sum_{j' \neq j}^{J} RCHAR_{ki}(j, j'),$$

where J = all the payment instruments. For example, $\overline{RCHAR}$ for cost in the check use equation is the average of the log ratios of check cost to the cost of each of the other payment instruments and it measures how a consumer evaluates the cost of checks relative to the cost of all the other payment methods. We expect the coefficients on all the average relative characteristics to be positive, because a higher numerical value of *CHAR* indicates a more positive assessment by a consumer, and we assume that consumers value all the characteristics.[11]

Although we focus on speed and security in this brief, other attributes might be more important in influencing payment behavior. Setup, convenience, cost, and record keeping were all highly statistically significant factors affecting payment method adoption. (Appendix Table 1 defines each characteristic used in the survey, except for the separate aspects of speed and security defined in Section III.) Convenience was the factor that affected the use of almost all

[11] Respondents assess the characteristics for all payment instruments, not only for those payment instruments they own or use. The ratings of adopters and nonadopters of a given payment instrument depend on the information each has about that payment instrument. Nonadopters may have the same information as adopters even though their experience is different. However, experience may give the adopters more information.

payment methods most strongly. Table 5 shows descriptive statistics of the payment instrument shares. Table 6 shows the estimated regression coefficients for all the characteristics, while Appendix Tables 2 and 3 show the full regression results for adoption and use, respectively.

A. Speed

The results show that certain aspects of speed statistically significantly influence the adoption of selected payment instruments, especially speed at the time of payment and speed of payment deduction. In particular, improving both aspects of speed would lead to higher adoption of ACH-based payments, namely OBBP and BANP. Adoption of checks and credit cards was not affected significantly by any form of speed.

Conditional on adoption, only speed time at checkout is statistically significant in influencing the use of payment instruments, and only checks and the two ACH-based payment methods are significantly affected. However, this aspect of speed is not included in the Federal Reserve strategic plan, and the scope for improvements in consumer welfare is small, because the time at checkout is already short and is unlikely to be affected by the Federal Reserve's policy. No other aspect of speed had a significant effect on payment use. The use of cash, debit cards, credit cards, or money orders was not significantly affected by any aspect of speed.

We analyzed credit card and debit card use by consumers' rating of the speed of deduction. Consumers who rate debit cards highly based on their speed of deduction also have high shares of debit card use. But the same is true for credit cards: consumers who rate credit cards highly based on their speed of deduction have high shares of credit card use. Interestingly, in regressions of debit card shares and credit card shares on the importance of the speed of payment deduction, as the importance of the speed of deduction increases, the share of credit cards decreases, but the share of debit cards increases. So the more important is the speed of payment deduction, the higher the share of debit cards and the lower the share of credit cards.

B. Security

Despite the ranking of security as the most important payment characteristic, security had only a modest effect on payment adoption or use. Security of financial wealth was the most statistically significant determinant of credit card and debit card use, indicating that consumers who rate credit and debit card security of financial wealth low relative to other payment instruments are significantly less likely to use them. Enhancing financial security could therefore help to increase credit card and debit card use among cardholders. Note that cards can be used in person, online, or on mobile devices, and that card use may occur through the use of payment services such as PayPal. Although card security may vary depending on location and/or device, our data do not allow us to estimate separate effects of security by location.

Security of personal information was the most significant determinant of OBBP adoption, both statistically and economically. This finding is consistent with the consumers' assessment of security of payments by location: consumers rated payments made in person or by mail as more secure than those made using the internet, and consumers rated payments made using mobile phones least secure. It is not surprising, therefore, that high assessments of security of personal information correspond with high adoption rates of OBBP. Although consumers' security rating of OBBP had a significant influence on their adoption of OBBP, OBBP was rated more secure than BANP. In the use stage, security of personal information had a small effect on the use of payment methods directly linked to bank accounts: checks, OBBP, and BANP. Security of payment transaction information (anonymity of purchases) was not significant in any payment adoption or use regressions.[12] This result is surprising for cash, which is alleged to be valued for its privacy and anonymity with respect to payment transactions.

[12] The results might vary by type of payment. In future research, we plan to explore the differences between bill and nonbill payments.

C. Other Characteristics

As Table 6 and Appendix Tables 2 and 3 demonstrate, other characetristics of payment instruments have more significant effect on payment adoption and use than do speed or security. The difference is especially apparent in the adoption stage, where the majority of coefficients on the payment characteristics are staitically significant, but convenience and cost tend to be significant in the use stage as well. Schuh and Stavins (2010, 2013) and Stavins (2013) discuss the effect of all characetristics on payment method adoption and use in greater detail.[13]

D. Payment Theft and Identity Theft Experience

In addition to questions about the security assessment of individual payment instruments, the SCPC asked respondents whether or not they had experienced loss, theft or fraud of a payment instrument in the previous 12 months. In 2013, 14.7 percent of respondents reported such an incidence, with 8.2 percent reporting loss or theft of cash, 5 percent reporting loss or theft of credit cards and debit cards, and only 1.2 reporting loss or theft of checks. The expected loss for a given payment instrument is a function of both the probability of the payment instrument being lost or stolen, and the expected financial loss following such an incident. Consumers who reported an incidence of loss, theft or fraud of credit cards had a significantly *higher* rating of security of financial wealth for credit cards. That could be because those consumers realized that they are not liable for any financial losses due to the 0 liability rule for credit cards. In contrast, consumers who reported loss, theft or fraud of cash had a significantly lower overall rating of security for cash. None of the other differences in security ratings between consumers who experienced theft and those who did not experience it were statistically significant. When experiencing loss, theft or fraud of any payment instrument variable was included in the regressions, it had a very small negative effect on the use of checks

[13] In response to a helpful suggestion from an anonymous referee, we checked the robustness of the model by estimating the entire model without convenience and comparing the results to the base model. The results are very robust: the estimated coefficients on the speed and security variables in both adoption and use regressions remain the same up to the second decimal place. Therefore the resulting elasticities remain the same, even up to the third decimal place.

and BANP, and those effects were only weakly statistically significant. Including the theft dummy variable did not change the coefficients on the security variables.

Turning to the issue of identity theft, we compared security ratings among groups of respondents with direct, indirect, or no experience with identity theft and found very little variation in average security ratings. The identity theft question in the SCPC is specified as follows:

Have you, or anyone you know well (family, friends, neighbors, coworkers, etc), ever been a victim of what you consider to be **identity theft**?

- 1 Yes, myself and someone I know well
- 2 Yes, someone I know well only
- 3 Yes, myself only
- 4 No

Respondents with no identity theft experience (those who replied "No" to the above question) rated the security of selected payment methods significantly higher than those who either had experienced identity theft themselves or knew someone who had experienced it. In particular, the ratings were higher for checks (all measures of security), for debit cards and for credit cards (security of personal information and confidentiality). To test whether experiencing identity theft influences consumers' adoption or use of individual payment methods, we included the variable in the regressions. Experiencing identity theft and/or knowing a person who had experienced it had almost no significant effect on the adoption or use of payment methods when controlling for demographics and income. The only exception was a negative and significant effect on the use of BANP from having directly experienced identity theft. Moreover, including those variables in the model did not change the overall effect of security on payment behavior.

We also followed the methodology in Kahn and Liñares-Zegarra (2015), who examined the effect of having experienced identity theft on the adoption and use of payment instruments using data from the 2009 SCPC survey. Here, we apply their methodology using the 2013 data: we estimate the adoption and use of payment instruments, but we replace the original assessment of security with a measure of security that is uncorrelated with the variable

representing the identity theft experience.[14] This way we can separate the effect of having experienced identity theft from the effect of security assessment on payment behavior. The results are shown in Appendix Tables 4 and 5. As above, identity theft had almost no significant effect on payment behavior, except for a negative and significant effect on the use of BANP of a respondent's having experienced identity theft directly. However, the effect of security on the adoption and use of payments *with or without identity theft* was similar: consumers who rated security higher were significantly more likely to adopt OBBP and BANP, and to use a significantly higher share of checks and debit cards .

Although identity theft is not explicitly mentioned in the Federal Reserve's strategic plan, preventing identity theft is clearly related to enhancing safety and security of payments—one of the plan's strategic goals. Nevertheless, the experience of identity theft was found to influence the use of payments only weakly, while security in general was a significant factor, regardless of whether or not consumers had experienced identity theft.

V. Simulating the Effect on Consumer Payment Behavior of Policies that Enhance Speed and Security

To better understand the implications of potential improvements in speed or security, we simulated enhancements in speed and security. We use our regression results to assess what would happen if the Federal Reserve undertook policies leading to the following outcomes: faster ACH-based payment systems and more-secure card systems.

For each of these simulations, we assume that all consumers would notice the improvement and that therefore all consumers would increase their rating of the payment methods in question. In reality, it is obviously more likely that an improvement would affect some consumers more than others, and that many consumers might not even be aware of a change. Therefore, our assumptions should be considered optimistic, and the resulting changes

[14] Kahn and Liñares-Zegarra (2015) first regress the relative SECURITY assessment on the identity theft incidence dummies, and then replace the assessment of security in the adoption and use regressions with the sum of the intercept and the residuals from that regression. That process ensures that the correlation between the new cleaned assessment of security and identity theft indicators is zero. For more information on this method, see Kahn and Liñares-Zegarra (2015).

in consumer payment behavior should be treated as an upper bound of what would be observed in reality.

To simulate the effect of potential policies, we increase the relative rating for a given payment instrument by 10% or 50%. To simulate the improvement in speed of ACH-based payments, we increase every consumer's rating of speed of OBBP and BANP (the two ACH-based payment instruments included in our survey). To simulate the improvement in security of payment cards, we increase every consumer's rating of the security of credit cards and debit cards. We then calculate the predicted increase in adoption or use, by using the estimated coefficients on the characteristic in question.

A. Faster-Speed ACH-Based Payment Systems

The first speed-related strategy on the FRFS proposed list is to "Evolve ACH." We assume that the strategy would lead to faster payment deduction and notification for ACH-based payments, namely, for OBBP and BANP. This simulation also has implications for a potential new payment service, such as the U.K. Faster Payment Service, which has some of the same functionality as ACH.[15] Consumers who rate the speed of payment deduction high for ACH-based payment methods—OBBP and BANP—have a significantly higher adoption rate of those payments. We assume that the relative rating of the speed of payment deduction for OBBP and BANP increases by 10 percent and measure how such a rating increase would change the adoption of those two payment instruments. We use a 10 percent increase, but the effect is linear, so it can be applied to any increase in speed. Recall that these ratings do not represent any real numbers, and translating a percentage increase in speed rating to a real-life situation is not straightforward. Because the FRFS market research study found that "end users … feel that their needs [regarding the speed of payments] are usually being met" (qualitative research, Phoenix International), even a 10 percent increase in speed rating might require a substantial improvement in the actual speed. Although we find that the adoption of both ACH payments would increase, the resulting increase is very small: the adoption of BANP would increase by

[15] See Greene, et al. (2014) for an analysis of the U.K. Faster Payment Service.

0.37 percentage point, from 66.2 percent to 66.6 percent, and the adoption of OBBP would increase by 0.43 percentage point, from 56.6 percent to 57.0 percent of consumers. Converting these results to elasticities, a 10 percent increase in the speed of deduction leads to a 0.62 percent increase in the probability of adoption of BANP and a 0.57 percent increase in the probability of adoption of OBBP, yielding estimated elasticities of adoption with respect to improvements in the speed of deduction of 0.062 and 0.057, respectively (Table 7 shows the results of this simulation).

B. More-Secure Card Systems

One of the FRFS proposed strategies is to "Work with payment system stakeholders to accelerate development and adoption of payment security standards and related business processes." Credit card and debit card use is higher for consumers who consider those payments more secure. One potential security standard adopted in other developed countries is the EMV chip card standard. The EMV chip technology has been recognized to improve security against fraud, as compared with the magnetic stripe card technology widely used in the United States.[16]

We simulate an improvement in the security of financial wealth, which could be created by an introduction of EMV. As in the speed simulation above, we assume that each consumer's relative rating of the security of financial wealth for credit cards and for debit cards increases by 10 percent, but translating an increase in security rating to a real-life situation is not straightforward. In fact quantifying security improvements is even more complex than quantifying changes in speed, which can be measured in units of time. The resulting increase in use is very small: the estimated share of credit card transactions increases by 0.22 percentage points, and the estimated share of debit card transactions increases by 0.16 percentage points. The estimated elasticities of payment card use with respect to improvements in the security of

[16] For example, the transition from magnetic stripe to EMV ("Chip and PIN") in the United Kingdom reduced point-of-sale (POS) card fraud from £219 million in 2004 to £72 million in 2006. The steep decline was partly due to the rapid transition of the entire system—terminals, ATMs, and cards—that took place between October 2003 and February 2006. In terms of percentage of spending, internet fraud declined by more than POS fraud, although the decline was smaller in terms of absolute value (Javelin Strategy & Research 2014).

financial wealth are 0.039 for debit cards and 0.084 for credit cards (Table 8 shows the results of this simulation).[17]

C. Comparison: Cost and Convenience Simulations

For comparison, we simulated an increase in the assessments of cost and convenience to show how much adoption and usage would change with respect to equivalent changes in those characteristics. The results show that increasing the assessment of the cost of ACH-based payments—OBBP and BANP—yields elasticities of 0.058 and 0.033, respectively, while increasing the assessment of convenience of ACH-based payments yields elasticities of 0.108 and 0.044, respectively. Those elasticities are qualitatively similar to the elasticities for speed.

Increasing the assessment of the cost of payment cards—debit and credit—yields elasticities of 0.030 and 0.145, respectively, while increasing the assessment of convenience of payment cards yields elasticities of 0.030 and 0.133, respectively. For credit cards, these elasticities are higher compared to security, but the magnitudes of the changes are still relatively modest. This is partly because the demographics account for some of the behavior and that the simple models are only able to account for a small percentage (in terms of R-squared) of payment choice.

VI. Conclusion

The Financial Services strategic plan lists speed and security of payments as important strategic initiatives for the next few years. However, the Federal Reserve Financial Services market research shows that consumers seem to be satisfied with the current speed of payments.[18] And even though payment security is important to consumers, we find that improving either speed or security of payments is unlikely to change consumers' payment behavior significantly.

[17] To induce a 1 percentage point increase in debit card use, all the aspects of security would have to increase by 66%. To induce a 1 percentage point increase in credit card use, all the aspects of security would have to increase by 99% (that is, approximately double).

[18] There were some notable exceptions: faster bill payments were important for some consumers, and faster notification was important for consumers who monitor their (near-zero) balances online.

Consumer payment adoption and use are influenced by consumers' perceptions of payment methods. We find that faster ACH payments would induce consumers to adopt ACH-based payments, and that more secure credit cards and/or debit cards would raise consumers' use of those instruments, but that the resulting changes would most likely be very small, at least in the short run. Consumers' adoption and use of payment instruments is highly inelastic with respect to changes in speed or security. This means that very large improvements in either speed or security would be needed to generate a noticeable increase in the adoption or use of these payment instruments. We simulated faster ACH-based payments and more secure card payments. The former were estimated to significantly increase the adoption of OBBP and BANP, while the latter were estimated to significantly increase the use of credit and debit cards. Nevertheless, the estimated elasticities were all below 0.1.

Although we cannot specify the exact cost of these innovations, it is very unlikely that such enhancements would increase consumer welfare, at least in the short run. However, we estimated only the effect on consumers as payers and did not include any potential effects on consumers as payees, on merchants, or on financial institutions. For example, the market research commissioned by the FRFS shows that large businesses in particular value fast notification and fund availability, and therefore the benefits to merchants from faster ACH might outweigh the cost. Faster transaction notification might bring some benefits for consumers whose liquidity is very limited, even if their payment choices remain unchanged. For security improvements, a reduction in payment card fraud losses to banks and merchants would reduce the overall payment system cost, possibly leading to lower retail prices for consumers. It is possible that the overall social benefits are higher than the total cost of any proposed enhancements and that therefore total social welfare might increase as a result. In addition, preventing security breaches might preserve public confidence in the payment system, benefitting consumers even if it does not change consumers' payment choices.

Our results complement the earlier FRFS findings, as we quantify the effect of speed or security improvements on the adoption or use of individual payment instruments by

consumers. Although the new FRFS strategic plan focuses on speed and security, other attributes of payments have a greater influence on consumer behavior.

References

Ching, Andrew and Fumiko Hayashi. 2010. "Payment Card Rewards Programs and Consumer Payment Choice." *Journal of Banking and Finance.* 34(8): 1773–1787.

Greene, Claire, et al. 2014. "Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States," Federal Reserve Bank of Boston Current Policy Perspectives No. 14-5.

Javelin Strategy & Research. 2014. *Fixing CNP Fraud: Solutions for a Pre- and Post-EMV U.S. Market*, October.

Kahn, Charles M. and José M. Liñares-Zegarra. 2015. "Identity Theft and Consumer Payment Choice: Does Security Really Matter?" *Journal of Financial Services Research*, April.

Schuh, Scott and Joanna Stavins. 2010. "Why Are (Some) Consumers (Finally) Writing Fewer Checks? The Role of Payment Characteristics." *Journal of Banking and Finance.* 34(8): 1745–1758.

Schuh, Scott, and Joanna Stavins. 2013. "How Consumers Pay: Adoption and Use of Payments," *Accounting and Finance Research*, 2(2).

Schuh, Scott, and Joanna Stavins. 2014. "The 2011 and 2012 Surveys of Consumer Payment Choice," Federal Reserve Bank of Boston Research Data Report No. 14-1.

Stavins, Joanna. 2013. "Security of Retail Payments: The New Strategic Objective," Federal Reserve Bank of Boston Public Policy Discussion Paper No. 13-9.

Table 1: Payment Characteristics Included in Annual SCPC Surveys

	2008	2009	2010	2011	2012	2013
Acceptance	✓	✓	✓	✓	✓	✓
Speed	✓					
Security	✓	✓	✓	✓	✓	✓
Cost	✓	✓	✓	✓	✓	✓
Convenience	✓	✓	✓	✓	✓	✓
Record keeping	✓		✓	✓	✓	✓
Control over timing	✓					
Setup	✓		✓	✓	✓	✓

Table 2: Comparison between FRFS and SCPC: Aspects of Speed

FRFS	SCPC
Transaction speed	Speed at time of payment
	Speed of notification of balances
Availability speed	Speed of recipient receiving payment
Posting speed	Speed of payment deduction

Source: FRFS: End User Research Report; SCPC: 2013 Survey of Consumer Payment Choice

Table 3: Ranking of Speed and Security Characteristics

Ranking	Characteristic	Least Important	Most Important
		(% consumers)	(% consumers)
1	Security of financial wealth	2.9	34.8
2	Security of personally identifiable information	4.6	20.1
3	Security of information about payment transactions	10.2	13.8
4	Speed at time of payment	16.1	9.0
5	Speed of payment deduction	20.2	8.3
6	Speed of notification of balances	16.0	7.2
7	Speed of recipient receiving payment	30.0	6.8

Source: Survey of Consumer Payment Choice 2013.
Note: The numbers show percent of respondents who rated each characteristic as "Least important" and "Most important." Each column adds up to 100.

Table 4: Ranking of All Characteristics in Annual SCPC Surveys

Characteristics	SCPC survey year					
	2008	2009	2010	2011	2012	2013
Security	1	1	1	1	1	2
Convenience/ Ease of use	2	2	2	2	2	1
Cost	4	3	3	3	3	3
Acceptance	5	4	4	4	4	4
Payment records	6	*na*	5	5	5	5
Acquisition & set up	8	*na*	6	6	6	6
Control of payment timing	3	*na*	*na*	*na*	*na*	*na*
Payment speed	7	*na*	*na*	*na*	*na*	*na*

Source: Survey of Consumer Payment Choice 2008–2013.

Table 5: Decsriptive statistics for payment instrument shares in 2013 SCPC

	Mean	Median	Min	Max
Cash	28.0	20.5	0	100
Check	9.8	3.9	0	100
Debit	28.8	24.0	0	100
Credit	19.2	6.7	0	100
Prepaid	1.6	0.0	0	100
OBBP	4.6	0.0	0	82.1
BANP	6.0	2.1	0	77.8
Money Order	0.0	0.0	0	100

Table 6: Payment Method Adoption (top panel) and Use (bottom panel) Regressions: Characteristics

Adoption	Cash	Check	Debit	Credit	Prepaid	OBBP	BANP	Money Order
Acceptance	*na*	.00	.07 *	-.07 *	.12 ***	.06	.0	.07 ***
Cost	*na*	.02 *	.10 ***	.05 ***	-.04	.20 ***	.12 ***	.03
Convenience	*na*	.01	.11 ***	.14 ***	.00	.30 ***	.09 ***	.07 ***
Setup	*na*	.05 ***	.12 ***	.15 ***	-.01	.17 ***	.07 *	.10 ***
Records	*na*	.04 ***	.09 ***	.14 ***	-.02	.20 ***	.08 **	.06 **
Speed at time of payment	*na*	.00	.19 ***	.05	.07	.14 ***	.06	.03
Speed of payment deduction	*na*	.02	.05	.01	.03	.24 ***	.27 ***	.06 **
Speed of notification of balances	*na*	.00	.04	-.03	.09 *	.07	-.02	.11 ***
Speed of recipient payment	*na*	.01	.06	-.05	.04	-.21 ***	.10 **	-.07 **
Security of financial wealth	*na*	.01	.02	.05 **	-.05 *	.07 *	.05	-.02
Security of personal information	*na*	-.02 *	.05 *	.02	.00	.15 ***	.01	.04
Security of confidentiality	*na*	.01	.02	.03	-.02	.02	.04	.02
Use	Cash	Check	Debit	Credit	Prepaid	OBBP	BANP	Money Order
Cost	.05 ***	-.02 *	.05 *	.08 ***	-.01	.00	-.01	.00
Convenience	.08 ***	.04 ***	.04	.10 ***	.02 ***	-.01	.02 *	.06 ***
Records	.03 ***	.01	.03	.02	.01 *	.03	.00	.01
Speed at time of payment	.02	.04 ***	.06	.04	.02 *	.05 ***	.02 **	.00
Speed of payment deduction	.01	-.05 ***	-.01	.02	.01	-.02	-.02	-.01
Speed of notification of balances	-.01	.01	.03	.03	.02 *	-.02	.00	-.01
Speed of recipient payment	.02	-.01	-.02	-.02	.00	.00	-.01	.00
Security of financial wealth	.00	.00	.05 ***	.06 ***	-.01 **	.01	-.02 ***	-.01
Security of personal information	.01	.02 **	.01	-.01	-.01 *	.03 **	.01 *	.02
Security of confidentiality	.01	.01	-.01	-.03 *	.01	-.01	.00	.02

Source: Survey of Consumer Payment Choice 2013.

Note: * significant at 10%, ** significant at 5%, *** significant at 1%. For full regression results see Appendix Tables 2 and 3.

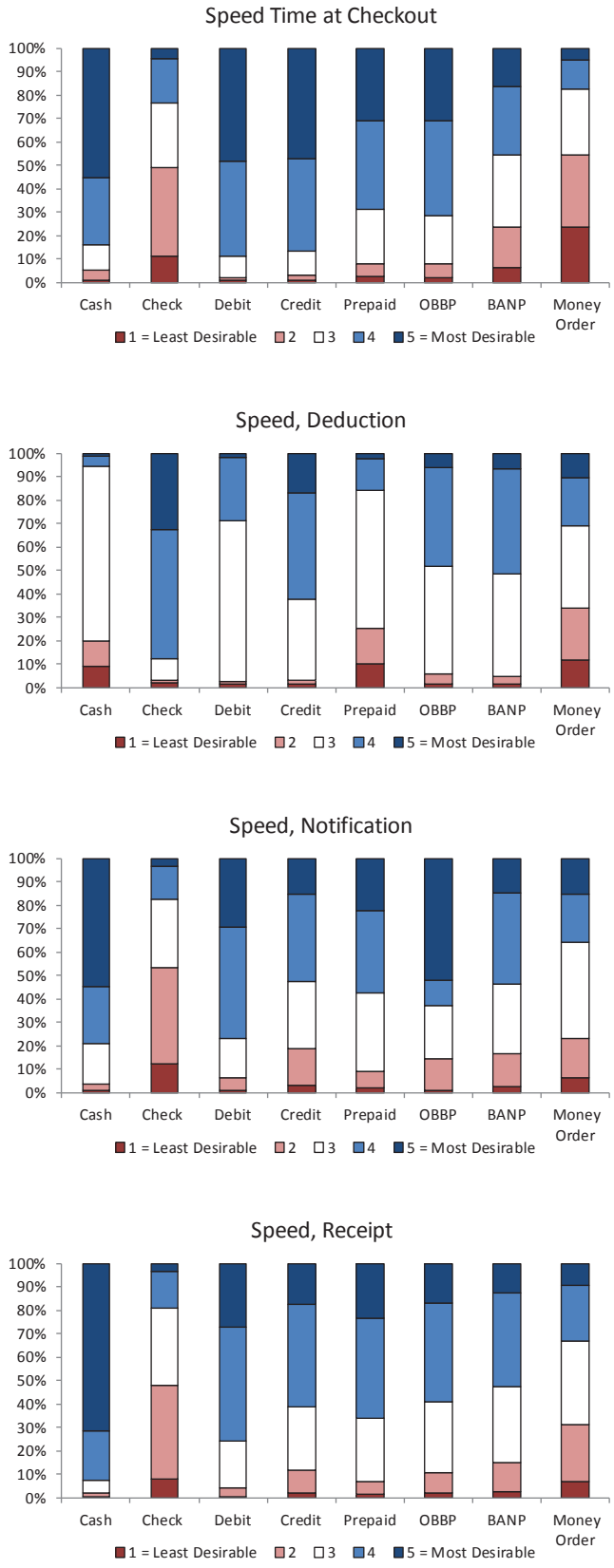
Table 7: Simulation Results of Increasing Speed of Notification and Deduction Rating by 10% and 50%

Description	OBBP	BANP
Adoption, Percentage of Consumers	54.99	63.06
Model Prediction, Adoption [Baseline]	56.60	66.24
	Difference: Simulation - Baseline	
Speed (Increase 10%)		
Increase Both Speed of Deduction and Speed of Notifcation	0.43	0.37
Increase Speed of Deduction	0.32	0.41
Increase Speed of Notification	0.11	-0.04
Speed (Increase 50%)		
Increase Both Speed of Deduction and Speed of Notifcation	2.11	1.79
Increase Speed of Deduction	1.56	2.01
Increase Speed of Notification	0.56	-0.22
	Elasticity	
Speed (Increase 10%)		
Increase Both Speed of Deduction and Speed of Notifcation	0.076	0.056
Increase Speed of Deduction	0.057	0.062
Increase Speed of Notification	0.019	-0.006

Table 8: Simulation Results of Increasing Security Rating by 10% and 50%

Description	Debit	Credit
Percent Share of Use, All Consumers	28.63	19.49
Model Prediction, Share of Use [Baseline]	40.52	26.23
	Difference: Simulation - Baseline	
Security (Increase 10%)		
Increase All Components of Security	0.16	0.10
Increase Security of Wealth	0.16	0.22
Increase Security of Personally Identifiable Information	0.02	-0.04
Increase Security of Confidential Information	-0.02	-0.08
Security (Increase 50%)		
Increase All Components of Security	0.82	0.51
Increase Security of Wealth	0.82	1.10
Increase Security of Personally Identifiable Information	0.10	-0.20
Increase Security of Confidential Information	-0.11	-0.39
	Elasticity	
Security (Increase 10%)		
Increase All Components of Security	0.039	0.038
Increase Security of Wealth	0.039	0.084
Increase Security of Personally Identifiable Information	0.005	-0.015
Increase Security of Confidential Information	-0.005	-0.030

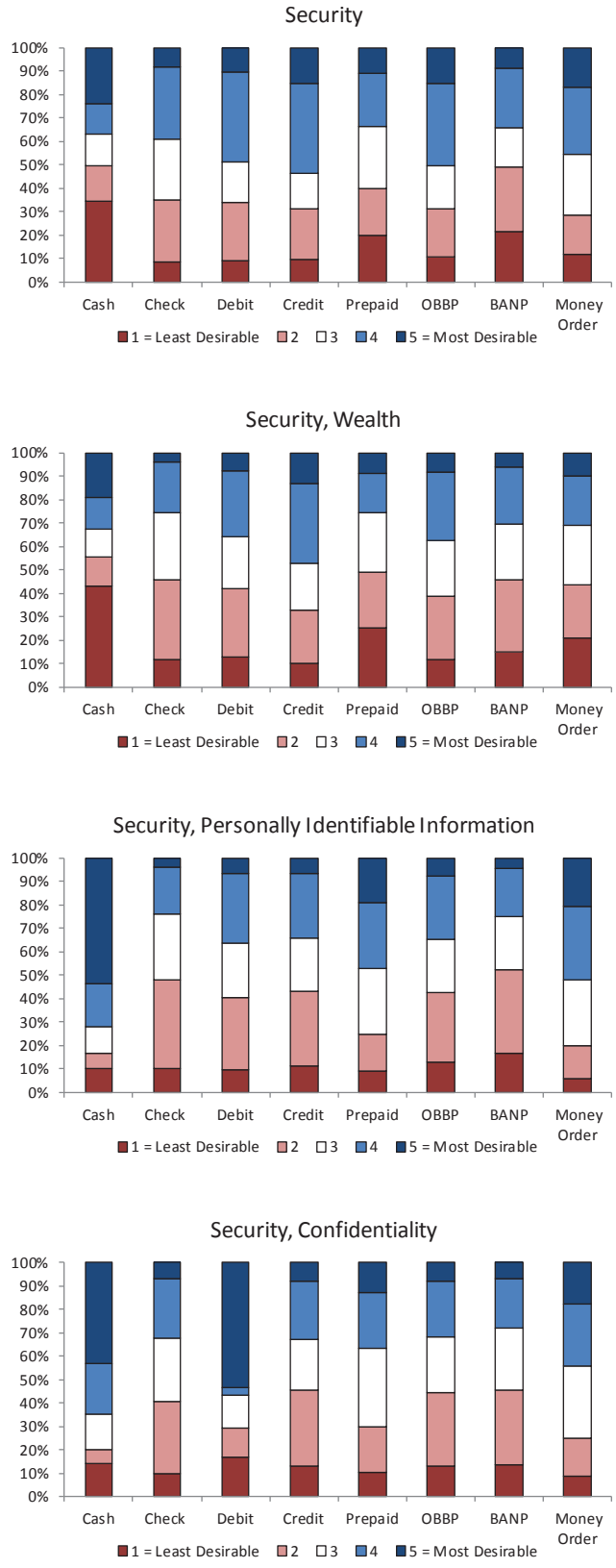
Figure 1: Rating of payment instrument speed



Source: 2013 SCPC

Note: OBBP refers to online banking bill payment; BANP refers to bank account number payment

Figure 2: Rating of payment instrument security



Source: 2013 SCPC

Note: OBBP refers to online banking bill payment; BANP refers to bank account number payment

Appendix: Comparing the SCPC and the Phoenix Faster Payments Research study

As part of the Faster Payments Research project, the Federal Reserve's Future Payments Team (FPT) commissioned Phoenix Marketing International (Phoenix) to survey consumers' preferences and attitudes concerning the speed of payments. Respondents were presented with various payment scenarios and asked to choose between four payment options in which different combinations of speed characteristics were assigned to different payment instruments. For each scenario, Phoenix specified a payment method and dollar value of the transaction. Based on the respondents' selections, Phoenix determined these consumers' preferences concerning payment speed.

The main difference between the SCPC and the Phoenix approach is that the SCPC collects revealed preference data, while Phoenix collects stated preference data. In other words, the SCPC collects data on which payment instruments consumers actually have and how they pay, while Phoenix collected data on what consumers said they would do in a hypothetical situation. Economists and other social scientists prefer to work with revealed preference data, because it is considered less likely to be biased.

The advantage of Phoenix's approach is the variety of the scenarios presented. The scenarios included point-of-sale transactions, bill payments, and person-to-person payments, and differentiated the dollar amount of transactions by payment method. However, drawing conclusions based on the results of these scenarios might be problematic. The main issue is that people may have strong prior assumptions associated with specific payment instruments. If so, they may select a payment method regardless of the degree of speed associated with each scenario. For example, a respondent who likes to write checks may select a check for his bill payment scenario, but it can be difficult to determine whether his selection was due to the speed of debiting funds, of receiving funds, of notification, or for reasons completely unrelated to any aspect of speed. It might be better not to reveal the payment instrument, but only provide the respondents with a set of features associated with a given transaction. In addition, because Phoenix does not employ regression analysis, their methodology does not allow for

estimating the effect of speed on payment choice while controlling for effects of demographic or income attributes.

In contrast, the SCPC approach allows respondents to rate various attributes of each payment method separately. A respondent may rate checks high because of their low cost and good record keeping capabilities, but rate checks low because of the long time it takes for the funds to be debited from the account. The SCPC survey asks respondents separately about their payment adoption and use and employs the technique of econometric regression, allowing us to estimate separately the effect of a respondent's rating of each characteristic—including each aspect of speed—on the respondent's payment behavior, while holding demographic and income attributes constant. This way, we not only learn whether a consumer considers each payment method to be desirable or undesirable based on each characteristic, but also are able to estimate the effect of the ratings on the adoption and use of each payment method, while controlling for demographic attributes and income. Our methodology allows us to test whether a low rating of checks because of the slowness with which funds are debited has a negative effect on the use of checks. In many cases, we find that consumer ratings of these characteristics do not significantly affect payment behavior.

Despite the differences in approach, the Phoenix findings are broadly in agreement with the findings of the SCPC. In particular, payment speed is not the most important attribute to consumers, and most of Phoenix's focus group respondents stated that their needs were met when it comes to payment speed. Phoenix found that "speed components make up 20 percent to 28 percent of importance in selection" of a payment method. Speed was found to be relatively less important for bill payments, and more important for nonbill online and point-of-sale transactions. However, Phoenix did not include "transaction time" (equivalent to speed time at checkout in the SCPC) in their discrete choice model, as they considered it too close to convenience. Among the aspects of speed they did include, payment deduction and notification were relatively important to consumers, whereas the SCPC found that speed time at checkout was most important and had the highest effect on payment use. Phoenix results are measured in terms of the percentage of consumers who prefer each speed alternative (for example, instant or

one-hour delay), rather than the percentage of consumers who would change their payment behavior if funds deduction or receipt were faster or slower. Based on the percentage of consumers who prefer various payment speed alternatives, it is difficult to predict whether and how they would alter their behavior.

Appendix Table 1: Payment Instrument Characteristics Definitions

Characteristic	Definition
Acceptance for payment	Please rate how likely each payment method is to be **ACCEPTED** for payment by stores, companies, online merchants, and other people or organizations.
Convenience	Please rate the **CONVENIENCE** of each payment method. *Examples: speed; record keeping; control over payment timing; ease of use; effort to carry, get or set up; ability to keep or store.*
Cost	Please rate the **COST** of using each payment method. *Examples: fees, penalties, postage, interest paid or lost; subscriptions or materials raise the cost; cash discounts and rewards (like frequent flyer miles) reduce the cost.*
Getting & setting up	Rate the task of **GETTING & SETTING UP** each payment method before you can use it. *Examples: getting cash at the ATM, length of time to get or set up, paper work, learning to use or install it, or travel.*
Payment records	Rate the quality of **PAYMENT RECORDS** offered by each method of payment. Consider both paper and electronic records. *Examples: proof of purchase, account balances, spending history, usefulness in correcting errors or dispute resolution, and ease of storage.*
Security	Suppose a payment method has been stolen, misused, or accessed without the owner's permission. Rate the **SECURITY** of each method against permanent financial loss or unwanted disclosure of personal information.

Appendix Table 2: Regression Results for Payment Instrument Adoption

Categories	Variables	Check		Debit		Credit		Prepaid		OBBP		BANP		Money Order	
Characteristics	Acceptance	.00		.07	*	-.07	*	.12	***	.06		.00		.07	***
	Cost	.02	*	.10	***	.05	***	-.04		.20	***	.12	***	.03	
	Convenience	.01		.11	***	.14	***	.00		.30	***	.09	***	.07	***
	Setup	.05	***	.12	***	.15	***	-.01		.17	***	.07	*	.10	***
	Records	.04	***	.09	***	.14	***	-.02		.20	***	.08	**	.06	**
	Speed Time at Checkout	.00		.19	***	.05		.07		.14	***	.06		.03	
	Speed Deduct	.02		.05		.01		.03		.24	***	.27	***	.06	**
	Speed Notify	.00		.04		-.03		.09	*	.07		-.02		.11	***
	Speed Receipt	.01		.06		-.05		.04		-.21	***	.10	**	-.07	**
	Security Wealth	.01		.02		.05	**	-.05	*	.07	*	.05		-.02	
	Security PII	-.02	*	.05	*	.02		.00		.15	***	.01		.04	
	Security Confidentiality	.01		.02		.03		-.02		.02		.04		.02	
Age [35-44 omitted]	Under 35	-.02		.05		-.07		-.10		.15	**	-.02		-.06	
	25-34	-.01		.00		-.07	**	-.02		.04		.05		-.02	
	45-54	.01		.02		-.01		-.08	**	-.04		.00		-.06	**
	55-64	.03	***	-.01		-.01		-.08	*	-.06		.01		-.03	
	65 or Over	.03	***	-.03		.02		-.17	***	-.10		-.07		-.07	*
Education [College omitted]	Less than High School	-.06		-.29	***	-.20	**	-.02		-.13		-.25	***	-.03	
	High School	-.07	***	-.07	**	-.12	***	-.15	***	-.06		-.09	**	-.04	
	Some College	-.05	***	-.02		-.08	***	-.04		-.02		-.03		.03	
	Graduate Degree	.02	*	-.04		.06	**	.07	*	-.02		.05		.00	
Marital Status [Married omitted]	Never Married	-.02	*	-.08	**	-.07	**	.03		.00		-.10	**	.00	
	Separated Divorced	-.05	**	-.03		-.09	***	.02		.02		-.03		-.03	
	Widowed	.01		-.05		.01		-.08		.09		.12	**	-.03	
	Household Size	.00		-.01		-.03	***	.01		.01		.00		.00	
Ethnicity	Latino	-.03	**	.03		-.03		.14	***	.05		-.01		.02	
Race [White omitted]	Black	-.08	***	.00		-.12	***	-.04		.02		-.04		.19	***
	Asian	.03	***	.08	**	.05		.13		-.05		.11		.02	
	Other	-.01		-.04		-.05		-.08		.05		.00		.06	
Gender	Male	-.02	*	-.02		-.03		-.08	***	.04		-.06	**	-.05	**
Income [$40K-$75K omitted]	<$25,000	-.18	***	-.14	***	-.18	***	.06		-.20	***	-.19	***	-.03	
	$25,000-$49,999	-.08	***	-.03		-.04		.00		-.03		-.05		.01	
	$75,000-$99,999	-.08	*	-.02		.06	**	.08	*	.03		-.02		-.05	
	>=$100,000	-.04		-.03		.06	**	.14	***	.05		-.01		.06	
	Not Highest Income In Household	.00		.03		-.03		.00		.00		.00		-.02	
Net Worth [$100K-$250K omitted]	< $50,000	-.02		.04		.04		-.01		-.01		.01		.09	***
	$50,000 - $100,000	-.03		-.02		.03		-.06		-.01		.02		.06	
	$250,000 - $399,999	.01		-.07	*	.08	***	.10	**	.04		-.05		.05	
	>= $500,000	.01		-.10	***	.04		.11	**	.02		-.01		-.02	
	Missing Net Worth	-.03		-.09		.00		.03		.04		.01		.12	
Employment Status [Employed omitted]	Retired	.01		-.01		.05	*	.01		.04		-.03		-.02	
	Disabled	-.03		-.01		-.06		.29	***	-.03		-.09		.11	**
	Unemployed	-.04	**	-.12	***	-.09	**	.07		-.05		-.09	*	.02	
	Homemaker	-.05		-.10	*	-.08		-.03		-.08		-.13	*	-.01	
	Other	-.07		-.06		-.09		.04		.03		.10		.11	
	Pay Bills	.01		.01		.01	*	.01		.02	**	.04	***	.01	
	Shops	.00		.01		.01		.02	*	.00		-.01		-.01	
	Born Abroad	.01		.02		.00		-.10	**	.03		-.04		.03	
	Homeowner	.03	**	.03		.10	***	-.05		.07	**	.10	***	-.06	**
	Ever Bankrupt (last 12 months)	-.01		-.07		.07	*	.01		.00		-.16		.04	
	Ever Bankrupt (last 7 years)	.00		.06		-.29	***	.02		.04		.14	***	.06	
	Number of Observations	1831		1833		1834		1829		1817		1776		1828	
	R-Squared (CHAR)	.45		.28		.43		.09		.24		.16		.21	
	R-Squared (No CHAR)	.41		.14		.36		.08		.10		.12		.15	

Appendix Table 3: Regression Results for Payment Instrument Use

Categories	Variables	Cash		Check		Debit		Credit		Prepaid		OBBP		BANP		Money Order	
Characteristics	Cost	.05	***	-.02	*	.05	*	.08	***	-.01		.00		-.01		.00	
	Convenience	.08	***	.04	***	.04		.10	***	.02	***	-.01		.02	*	.06	***
	Records	.03	***	.01		.03		.02		.01	*	.03		.00		.01	
	Speed Time at Checkout	.02		.04	***	.06		.04		.02	*	.05	***	.02	**	.00	
	Speed Deduct	.01		-.05	***	-.01		.02		.01		-.02		-.02		-.01	
	Speed Notify	-.01		.01		.03		.03		.02	*	-.02		.00		-.01	
	Speed Receipt	.02		-.01		-.02		-.02		.00		.00		-.01		.00	
	Security Wealth	.00		.00		.05	***	.06	***	-.01	**	.01		-.02	***	-.01	
	Security PII	.01		.02	**	.01		-.01		-.01	*	.03	**	.01	*	.02	
	Security Confidentiality	.01		.01		-.01		-.03	*	.01		-.01		.00		.02	
Age [35-44 omitted]	Under 25	-.09	***	.03		.01		.06		.02		-.01		.00		-.07	*
	25-34	-.03		.00		-.02		.10	***	.01		-.03	**	-.02		-.05	***
	45-54	.01		.01		-.05	**	.02		.01		.01		.00		.00	
	55-64	.00		.02		-.02		.01		.00		.03	**	.00		.01	
	65 or Over	-.02		.03	**	-.05		.05		.00		.00		.00		.06	*
Education [College omitted]	Less than High School	.11	***	.02		.03		.00		.04	**	-.03		.01		-.08	**
	High School	.02		.03	***	.04		-.04	*	.00		-.01		.02		-.03	
	Some College	.02		.01		.04	**	-.02		-.01		-.01		.02	**	-.01	
	Post Graduate	.01		.01		.00		.00		.00		-.01		.01		-.02	
Marital Status [Married omitted]	Never Married	.05	***	-.01		.02		.00		-.01		-.01		.01		.03	
	Separated or Divorced	.01		.00		.02		-.01		-.02	*	.03	**	.01		-.01	
	Widowed	-.02		.00		.09	**	-.04		-.01		-.01		-.01		-.03	
	Household Size	.00		.00		.01	*	.00		.00		.00		.00		.00	
Ethnicity	Latino	.02		.01		.03		-.04	**	.02		-.01		.01		-.01	
Race [White omitted]	Black	.02		.01		.07	***	-.05	*	.04	***	.01		.02		.03	
	Asian	-.02		.01		-.11	**	.12	***	.04	*	-.03		.01		.00	
	Other	.03		-.02		.03		.03		-.02	*	-.03	*	-.03	**	-.01	
Gender	Male	.04	***	-.02	***	-.01		-.01		-.01		-.01		.00		-.03	*
Income [$40K-$75K omitted]	<$25,000	.08	***	.01		.06	**	-.04	*	.03	***	.02		-.01		.00	
	$25,000 - $49,000	.01		.02		.02		-.02		.00		-.01		.01		.03	*
	$75,000 - $99,999	-.04	**	.00		.02		.01		.01		.01		.01		-.01	
	>=$100,000	-.02		.01		-.04		.02		.01		.00		.01		.03	
	Not Highest Income In Household	.03	***	-.01	*	.00		-.02		-.01		.00		-.01		-.02	
Net Worth [$100K-$250K omitted]	< $50,000	-.02		.00		.01		-.01		.00		.00		.01		.04	
	$50,000 - $100,000	-.01		.01		.02		.00		.01		.02		-.01		.02	
	$250,000 - $399,999	-.03		.00		-.01		.07	***	.01		-.01		-.01		.03	
	>= $500,000	-.01		.01		-.05	*	.06	***	.01		-.01		.00		.00	
	Missing Net Worth	.04		-.01		.03		.00		.01		-.02		.00		.01	
Employment Status [Employed omitted]	Retired	.00		.00		-.05	*	.03		-.01		.02		.00		-.04	
	Disabled	.00		.03		-.02		.11	***	.02		-.05	**	-.01		.02	
	Unemployed	.00		.00		.03		.07	**	-.01		-.02		.01		.02	
	Homemaker	.02		.00		.01		.00		-.03	**	.01		-.01		.15	***
	Other	.01		.01		-.09		.17	***	-.01		-.05	*	.00		-.01	
Financial Responsibility	Pay Bills	.00		.00		-.01		.00		.00		.00		.00		.02	***
	Shops	.00		.00		.00		.00		.00		.00		.00		-.01	**
	Born Abroad	-.01		-.02		-.04		.03		-.02		.02		.00		-.01	
Number of Other Payment Instruments Adopted [Three omitted]	Fewer than Three	.23	***	.08	***	.03		.01		.09	***	-.04		.06		.08	***
	Four	.00		-.07	***	-.03		-.07	***	-.03	**	-.02		.02	*	.00	
	Five	-.04	**	-.10	***	-.05	**	-.05	**	-.02	**	-.04	**	.00		-.04	
	Six	-.04	*	-.11	***	-.09	***	-.06	***	-.02		-.06	***	.00		-.03	
	Seven	.00		-.14	***	-.09	**	-.07	*	-.02		-.05	**	-.03	*	-.04	
	Revolved on Credit	-.02	*	.03	***	.05	***	-.11	***	-.01		.01		.02	***	-.03	*
	Inverse Mills Ratio			-.07	***	-.22	***	-.03		.05		-.04		-.04		.01	
	Number of Observations	1779		1764		1765		1765		1763		1751		1712		1762	
	Adjusted R-Squared (CHAR)	.31		.27		.26		.36		.20		.12		.10		.14	
	Adjusted R-Squared (No CHAR)	.28		.23		.24		.30		.18		.10		.09		.13	

Appendix Table 4: Adoption, Following Kahn and Liñares-Zegarra Methodology

Categories	Variables	Check		Debit		Credit		Prepaid		OBBP		BANP		Money Order	
Characteristics	Acceptance	0.00		0.05		-0.07	*	0.11	***	0.06		0.00		0.07	***
	Cost	0.03	*	0.10	***	0.06	***	-0.04		0.20	***	0.11	**	0.03	
	Convenience	0.01		0.12	***	0.15	***	0.00		0.28	***	0.08	**	0.06	***
	Setup	0.05	***	0.12	***	0.15	***	-0.01		0.16	***	0.07		0.10	***
	Records	0.04	***	0.09	***	0.17	***	-0.02		0.19	***	0.06		0.04	*
	Speed at Time of Pay	0.00		0.19	***	0.07		0.07		0.16	***	0.06		0.03	
	Speed Deduct	0.02		0.04		0.01		0.03		0.22	***	0.26	***	0.05	**
	Speed Notify	0.00		0.05		-0.03		0.09	*	0.08		-0.01		0.12	***
	Speed Receipt	0.01		0.07		-0.04		0.04		-0.21	***	0.10	**	-0.07	**
	Security	-0.01		0.05	**	-0.04		-0.01		0.14	***	0.08	***	0.04	*
Age [35-44 omitted]	Under 25	-0.02		0.06		-0.08		-0.09		0.16	**	-0.02		-0.05	
	25-34	-0.02		0.00		-0.08	**	-0.03		0.06		0.05		-0.02	
	45-54	0.00		0.02		-0.01		-0.09	**	-0.03		-0.01		-0.06	**
	55-64	0.03	***	-0.01		-0.01		-0.08	*	-0.04		0.01		-0.03	
	65 or Over	0.03	***	-0.03		0.02		-0.17	***	-0.07		-0.07		-0.07	**
Education [College omitted]	Less than High School	-0.08	*	-0.28	***	-0.20	**	-0.04		-0.13		-0.26	***	-0.02	
	High School	-0.07	***	-0.07	**	-0.13	***	-0.15	***	-0.05		-0.10	**	-0.04	
	Some College	-0.05	***	-0.01		-0.09	***	-0.04		-0.03		-0.04		0.03	
	Graduate Degree	0.02	*	-0.04		0.06	**	0.08	**	-0.02		0.06		0.00	
Marital Status [Married omitted]	Never Married	-0.02	*	-0.08	**	-0.07	**	0.02		0.01		-0.11	***	0.00	
	Separated Divorced	-0.04	**	-0.03		-0.08	**	0.02		0.03		-0.03		-0.02	
	Widowed	0.01		-0.04		0.01		-0.08		0.08		0.11	**	-0.02	
	Household Size	0.00		-0.01		-0.03	***	0.01		0.01		0.00		0.00	
Ethnicity	Latino	-0.03	**	0.02		-0.02		0.14	***	0.07		-0.02		0.02	
Race [White omitted]	Black	-0.07	***	0.00		-0.12	***	-0.04		0.02		-0.05		0.20	***
	Asian	0.03	***	0.08	**	0.06		0.12		-0.05		0.08		0.03	
	Other	-0.01		-0.05		-0.05		-0.10	*	0.04		-0.01		0.06	
Gender	Male	-0.02	**	-0.02		-0.03		-0.08	***	0.03		-0.05	**	-0.04	**
Income [$40K-$75K omitted]	<$25,000	-0.17	***	-0.14	***	-0.19	***	0.06		-0.19	***	-0.19	***	-0.02	
	$25,000-$49,999	-0.07	***	-0.03		-0.04		0.00		-0.02		-0.05		0.02	
	$75,000-$99,999	-0.07	*	-0.02		0.07	**	0.09	*	0.04		-0.02		-0.04	
	>=$100,000	-0.04		-0.02		0.07	**	0.14	***	0.07		0.00		0.06	*
	Not Highest Income In Household	0.00		0.03		-0.03		-0.01		0.00		0.01		-0.02	
Net Worth [$100K-$250K omitted]	< $50,000	-0.02		0.03		0.04		0.00		-0.02		0.01		0.08	***
	$50,000 - $100,000	-0.03		-0.03		0.03		-0.04		-0.01		0.02		0.06	
	$250,000 - $399,999	0.01		-0.08	*	0.08	***	0.10	**	0.04		-0.05		0.04	
	>= $500,000	0.02		-0.12	***	0.04		0.11	***	0.02		-0.01		-0.03	
	Missing Net Worth	-0.03		-0.11		0.01		0.04		0.04		0.03		0.11	
Employment Status [Employed omitted]	Retired	0.01		-0.01		0.06	*	0.01		0.04		-0.03		-0.02	
	Disabled	-0.03		-0.02		-0.05		0.29	***	-0.03		-0.09		0.11	**
	Unemployed	-0.05	**	-0.12	***	-0.09	**	0.07		-0.07		-0.08	*	0.01	
	Homemaker	-0.04		-0.11	*	-0.07		-0.03		-0.07		-0.12	*	-0.02	
	Other	-0.07		-0.06		-0.10		0.04		0.02		0.10		0.12	
	Pay Bills	0.01		0.01		0.02	*	0.01		0.02	**	0.04	***	0.01	
	Shops	0.00		0.01		0.01		0.02	*	0.00		-0.01		-0.01	
	Born Abroad	0.01		0.03		0.00		-0.10	**	0.03		-0.04		0.03	
	Homeowner	0.03	**	0.03		0.10	***	-0.05		0.07	*	0.10	***	-0.05	**
	Ever Bankrupt (last 12 months)	-0.01		-0.07		0.07		0.01		0.00		-0.14		0.03	
	Ever Bankrupt (last 7 years)	0.00		0.06		-0.29	***	0.02		0.04		0.14	***	0.05	
ID Theft	Yes, myself and someone I know well	-0.02		0.03		-0.02		0.02		0.08		-0.06		0.09	*
	Yes, someone I know well	-0.03	*	0.01		0.00		0.03		0.02		0.02		0.06	*
	Yes, myself only	-0.01		-0.04		-0.02		-0.03		-0.07		0.03		-0.01	
	Number of Observations	1838		1838		1835		1837		1823		1779		1832	
	R-Squared (CHAR)	0.45		0.28		0.43		0.09		0.24		0.16		0.21	
	R-Squared (No CHAR)	0.42		0.14		0.36		0.08		0.10		0.12		0.15	

Appendix Table 5: Use, Following Kahn and Liñares-Zegarra Methodology

Categories	Variables	Cash		Check		Debit		Credit		Prepaid		OBBP		BANP		Money Order	
Characteristics	Cost	0.05	***	-0.02		0.04		0.08	***	-0.01		-0.02		-0.02		0.00	
	Convenience	0.08	***	0.04	***	0.03		0.10	***	0.02	***	-0.03		0.02	**	0.06	***
	Records	0.03	***	0.01		0.02		0.04		0.01	*	0.02		0.00		0.00	
	Speed at Time of Pay	0.02		0.04	***	0.07	*	0.04		0.02		0.05	***	0.02	**	0.00	
	Speed Deduct	0.01		-0.05	***	0.01		0.03		0.01		-0.02		-0.03		-0.01	
	Speed Notify	-0.01		0.02		0.03		0.03	*	0.02	*	-0.02		0.00		0.00	
	Speed Receipt	0.02		-0.01		-0.02		-0.03		0.00		0.00		-0.01		0.00	
	Security	0.01		0.03	***	0.07	***	0.00		-0.01	*	0.02	*	0.00		0.02	
Age [35-44 omitted]	Under 25	-0.09	***	0.03		0.01		0.06		0.02		-0.02		0.00		-0.07	*
	25-34	-0.03		-0.01		-0.02		0.10	***	0.01		-0.02	**	-0.01		-0.05	**
	45-54	0.01		0.01		-0.05	**	0.02		0.01		0.02		0.00		0.00	
	55-64	0.00		0.02		-0.02		0.01		0.00		0.03	***	0.01		0.01	
	65 or Over	-0.02		0.04	**	-0.05		0.04		0.01		0.01		0.00		0.06	*
Education [College omitted]	Less than High School	0.11	***	0.02		0.03		0.00		0.04	**	-0.02		0.02		-0.07	**
	High School	0.02		0.03	***	0.03		-0.04	**	0.00		0.00		0.02	*	-0.02	
	Some College	0.02		0.01		0.03	*	-0.03		0.00		-0.01		0.02	***	0.00	
	Post Graduate	0.01		0.01		0.00		0.00		0.00		-0.01		0.01		-0.02	
Marital Status [Married omitted]	Never Married	0.05	***	-0.02	*	0.02		0.01		-0.01		0.00		0.01		0.03	
	Separated or Divorced	0.01		0.00		0.02		0.00		-0.02	*	0.03	**	0.01		-0.01	
	Widowed	-0.02		0.00		0.09	**	-0.04		-0.01		-0.01		-0.01		-0.03	
	Household Size	0.00		0.00		0.01	*	0.00		0.00		0.00		0.00		0.00	
Ethnicity	Latino	0.02		0.01		0.03		-0.05	**	0.02		-0.01		0.01		-0.02	
Race [White omitted]	Black	0.02		0.01		0.07	***	-0.05	**	0.04	***	0.01		0.02		0.04	
	Asian	-0.02		0.01		-0.12	***	0.12	***	0.03	*	-0.03		0.01		0.01	
	Other	0.04	*	-0.02		0.02		0.03		-0.02	*	-0.03	**	-0.02	*	0.00	
Gender	Male	0.04	***	-0.02	***	-0.02		-0.01		-0.01		-0.01		0.00		-0.03	*
Income [$40K-$75K omitted]	<$25,000	0.08	***	0.01		0.05	**	-0.04		0.03	***	0.03		-0.01		0.00	
	$25,000 - $49,000	0.01		0.02		0.03		-0.02		0.00		-0.01		0.01		0.03	
	$75,000 - $99,999	-0.04	**	0.00		0.02		0.01		0.01		0.00		0.01		-0.01	
	>=$100,000	-0.02		0.01		-0.04	*	0.03		0.01		0.00		0.00		0.03	
	Not Highest Income In Household	0.03	***	-0.01	*	0.00		-0.02		-0.01		0.00		-0.01		-0.02	
Net Worth [$100-$250K omitted]	< $50,000	-0.02		0.00		0.01		0.00		0.00		0.01		0.01		0.03	
	$50,000 - $100,000	-0.01		0.00		0.02		-0.01		0.01		0.02		-0.01		0.03	
	$250,000 - $399,999	-0.03		0.00		-0.01		0.07	***	0.01		-0.01		-0.01		0.02	
	>= $500,000	-0.01		0.01		-0.05	*	0.07	***	0.01		0.00		0.00		-0.01	
	Missing Net Worth	0.04		-0.01		0.04		0.00		0.01		-0.03		-0.01		0.01	
Employment Status [Employed omitted]	Retired	0.00		0.00		-0.05	*	0.03		-0.01		0.02		0.00		-0.03	
	Disabled	0.00		0.03		-0.02		0.11	***	0.02		-0.04	*	-0.01		0.02	
	Unemployed	0.01		0.00		0.02		0.06	**	-0.01		-0.02		0.00		0.02	
	Homemaker	0.02		0.00		0.00		0.00		-0.03	**	0.02		-0.01		0.15	***
	Other	0.01		0.01		-0.08		0.16	***	-0.01		-0.05	*	0.00		0.00	
Financial Responsibility	Pay Bills	0.00		0.00		-0.01		0.00		0.00		0.00		0.00		0.01	**
	Shops	0.00		0.00		0.00		0.00		0.00		0.00		0.00		-0.01	*
ID Theft	Yes, myself and someone I know well	-0.03		0.00		-0.03		0.03		0.00		-0.02		0.00		0.04	*
	Yes, someone I know well	0.00		0.02		0.00		-0.03	*	0.00		0.01		0.00		0.02	
	Yes, myself only	0.03		-0.02		0.06	*	0.00		0.01		-0.02		-0.05	***	-0.02	
	Born Abroad	-0.01		-0.02		-0.03		0.03		-0.02		0.02		0.00		0.00	
Number of Other Payment Instruments Adopted [Three omitted]	Fewer than Three	0.24	***	0.08	***	0.03		0.00		0.09	***	-0.03		0.05		0.08	***
	Four	0.00		-0.07	***	-0.03		-0.07	***	-0.02	*	-0.02		0.02		0.00	
	Five	-0.04	**	-0.10	***	-0.05	*	-0.05	**	-0.02	*	-0.04	**	0.00		-0.04	
	Six	-0.04	*	-0.11	***	-0.09	***	-0.06	**	-0.01		-0.05	***	0.00		-0.03	
	Seven	0.00		-0.13	***	-0.09	**	-0.06	*	-0.02		-0.05	**	-0.03	*	-0.04	
	Revolved on Credit	-0.02	*	0.03	***	0.06	***	-0.11	***	-0.01		0.01		0.02	***	-0.03	**
	Inverse Mills Ratio			-0.06	***	-0.20	***	-0.05		0.04		-0.07	**	-0.05		0.01	
	Number of Observations	1779		1769		1770		1766		1768		1755		1714		1764	
	Adjusted R-Squared (CHAR)	0.32		0.27		0.25		0.35		0.20		0.11		0.10		0.14	
	Adjusted R-Squared (No CHAR)	0.28		0.23		0.23		0.30		0.18		0.10		0.09		0.14	

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