



EUROPEAN CENTRAL BANK
EUROSYSTEM

Working Paper Series

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How do speed and security influence consumers' payment behavior?

No 1871 / December 2015



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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

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.

C. Other Characteristics

As Table 6 and Appendix Tables 2 and 3 demonstrate, other characteristics 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 statically 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 characteristics 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: Descriptive 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	<i>na</i>	.00	.07 *	-.07 *	.12 ***	.06	.0	.07 ***
Cost	<i>na</i>	.02 *	.10 ***	.05 ***	-.04	.20 ***	.12 ***	.03 ***
Convenience	<i>na</i>	.01	.11 ***	.14 ***	.00	.30 ***	.09 ***	.07 ***
Setup	<i>na</i>	.05 ***	.12 ***	.15 ***	-.01	.17 ***	.07 *	.10 ***
Records	<i>na</i>	.04 ***	.09 ***	.14 ***	-.02	.20 ***	.08 **	.06 **
Speed at time of payment	<i>na</i>	.00	.19 ***	.05 ***	.07	.14 ***	.06 ***	.03
Speed of payment deduction	<i>na</i>	.02	.05	.01	.03	.24 ***	.27 ***	.06 **
Speed of notification of balances	<i>na</i>	.00	.04	-.03	.09 *	.07	-.02	.11 ***
Speed of recipient payment	<i>na</i>	.01	.06	-.05	.04	-.21 ***	.10 **	-.07 **
Security of financial wealth	<i>na</i>	.01	.02	.05 **	-.05 *	.07 *	.05	-.02
Security of personal information	<i>na</i>	-.02 *	.05 *	.02	.00	.15 ***	.01	.04
Security of confidentiality	<i>na</i>	.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.

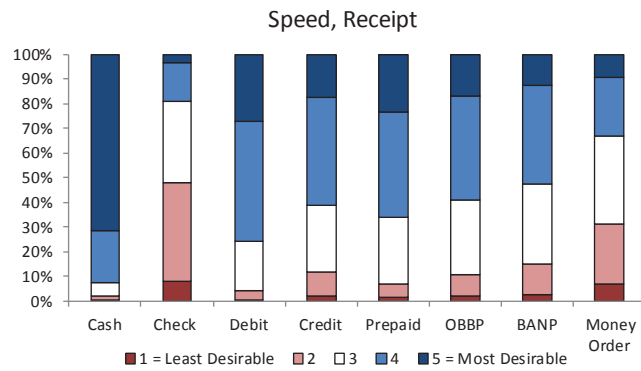
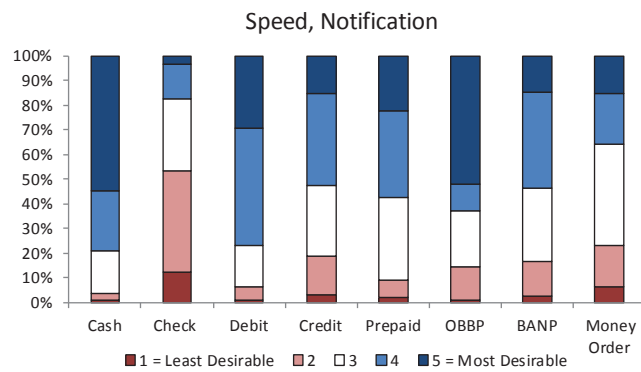
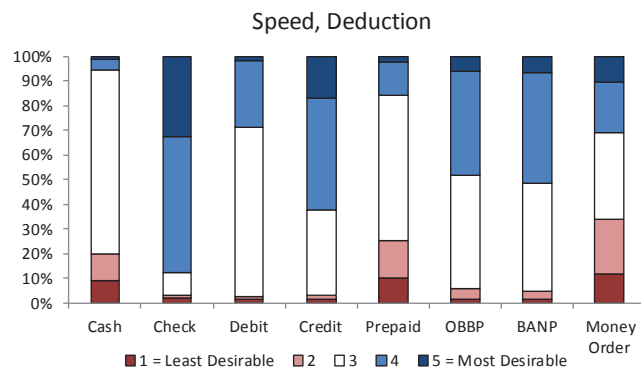
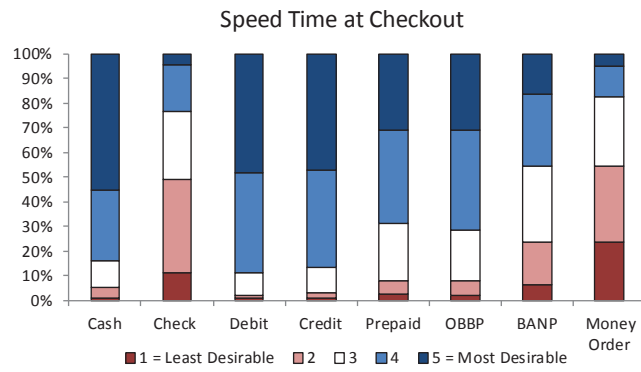
Table 7: Simulation Results of Increasing Speed of Notification and Deduction Rating by 10% and 50%

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 Notification	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 Notification	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 Notification	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

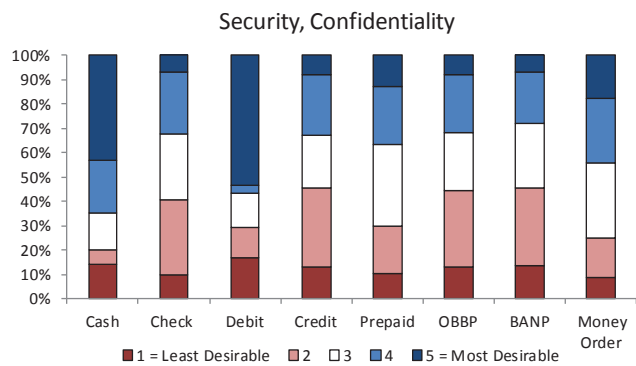
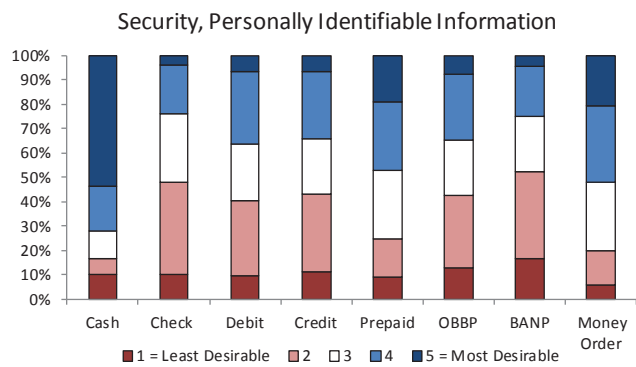
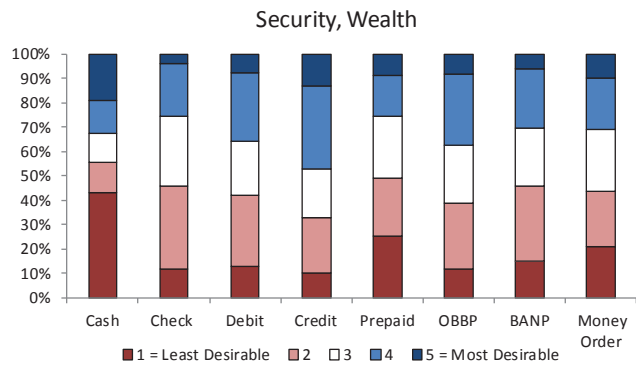
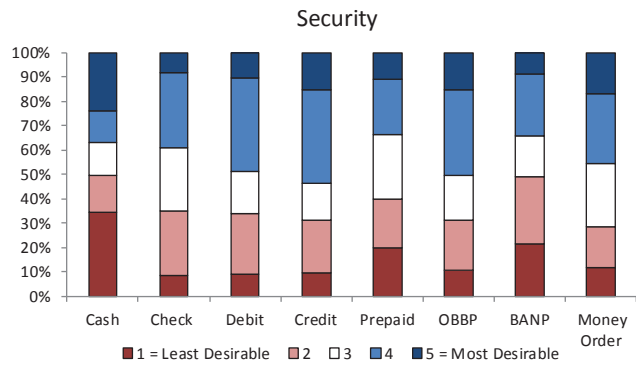
Figure 1: Rating of payment instrument speed



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. <i>Examples: speed; record keeping; control over payment timing; ease of use; effort to carry, get or set up; ability to keep or store.</i>
Cost	Please rate the COST of using each payment method. <i>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.</i>
Getting & setting up	Rate the task of GETTING & SETTING UP each payment method before you can use it. <i>Examples: getting cash at the ATM, length of time to get or set up, paper work, learning to use or install it, or travel.</i>
Payment records	Rate the quality of PAYMENT RECORDS offered by each method of payment. Consider both paper and electronic records. <i>Examples: proof of purchase, account balances, spending history, usefulness in correcting errors or dispute resolution, and ease of storage.</i>
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
Ethnicity	Household Size	.00	-.01	-.03 ***	.01	.01	.00	.00
	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
Ethnicity	Household Size	.00	.00	.01 *	.00	.00	.00	.00	.00
	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
Net Worth [\$100K-\$250K omitted]	Not Highest Income In Household	.03 ***	-.01 *	.00	-.02	-.01	.00	-.01	-.02
	< \$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 **
Number of Other Payment Instruments Adopted [Three omitted]	Born Abroad	-.01	-.02	-.04	.03	-.02	.02	.00	-.01
	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	***
	High School	-0.07	***	-0.07	**	-0.13	***	-0.15	***	-0.05		-0.10	**
	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	***
	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	**
Ethnicity	Household Size	0.00		-0.01		-0.03	***	0.01		0.01		0.00	0.00
	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	**
Income [\$40K-\$75K omitted]	<\$25,000	-0.17	***	-0.14	***	-0.19	***	0.06		-0.19	***	-0.19	***
	\$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	*
	Homemaker	-0.04		-0.11	*	-0.07		-0.03		-0.07		-0.12	*
	Other	-0.07		-0.06		-0.10		0.04		0.02		0.10	0.12
ID Theft	Pay Bills	0.01		0.01		0.02	*	0.01		0.02	**	0.04	***
	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	***
	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	***	
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	**
	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	
Ethnicity	Household Size	0.00	0.00	0.01 *	0.00	0.00	0.00	0.00	0.00	
	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	
Number of Other Payment Instruments Adopted [Three omitted]	Born Abroad	-0.01	-0.02	-0.03	0.03	-0.02	0.02	0.00	0.00	
	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 **
Summary Statistics	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	

Acknowledgements

The authors thank Fumiko Hayashi, Zach Markiewicz, Will Roberds, Robert Triest, participants at the ECB/Bank of Finland conference and anonymous referees for helpful comments, and Sean Connolly and Allie Cole for excellent research assistance. A version of this paper is published in Contemporary Economic Policy journal. The views expressed in this paper are those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Boston or the Federal Reserve System.

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ISSN 1725-2806 (online)
ISBN 978-92-899-1684-4
DOI 10.2866/195112
EU catalogue No QB-AR-15-111-EN-N